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EDITORIAL NOTES—GAS, &c.

North of England Association Meeting.

THE technical proceedings at the half-yearly meeting of the North of England Gas Managers' Association on Saturday, held under the presidency of Mr. H. Wilkinson, of Harrogate, were divided into three parts; each part being on a subject having a distinct individuality. Mr. C. H. Armstrong, of Wallsend, read a paper on "Depreciation and "Kindred Matters;" Mr. J. E. Morfett, of Sunderland, one on "A Successful Method of Working a Slot-Meter Busi-"ness;" and Mr. Alexander Allan, one on "High Tem-"perature Carbonization." The communications were therefore representative of finance, a phase of the commercial management of a gas undertaking, and a technical question over which there has recently been some discussion in these columns. Mr. Armstrong's communication is treated upon in another column.

Turning to the paper on "High-Temperature Carboniza-"tion," it is pretty safe to say that Mr. Alexander Allan would exhaust all Professor Lewes's eloquence and persuasion, and then would not see wherein lay any advantage to him, as the responsible officer of the Scarborough Gas Company, in abandoning high-temperature carbonization for low-temperature working under the "Coalite" process; and after reading Mr. Allan's paper, we rather think the Professor would deem it imprudent to waste his time in trying to get a convert from Scarborough. Mr. Allan advocates, for well-considered reasons that have been subjected to the test of years of practice, the conjunction of coal gas making in retorts working at high temperatures with the manufacture of a fairly high-grade carburetted water gas; and his advocacy is compressed into a short paper that is full of technical pith. The carbonizing results at Scarborough are notoriously good; and the paper will bring these still more into prominence. It is unnecessary to quote them, as they are merely given in the paper as part of the case to show the financial effects of the combined working. It would, however, have been interesting had Mr. Allan gone a step or two further, and stated (though it can be approximately calculated) what is the calorific value of the mixed gas he sends out containing 25 per cent. of carburetted water gas of 21·35-candle power, what was his average selling price of coke last year, and what he really estimates is the difference in the higher price of coke he obtained through the absorption of part of his coke production by the carburetted water-gas plant.

Respecting the last point, all owners of water-gas plants working on the lines advocated by Mr. Allan, cannot claim a higher average receipt per ton or chaldron of coke under all conditions of general demand; inasmuch as the higher value they would like to ask as the result of the restricting of their own output must yield to the circumstance of a free market for coke. And a higher price, when the demand for coke is not generally good, invites other undertakings with an unsaleable and growing stock to find relief outside their own area for part of their surplus at reduced prices. Although individually we may not like this kind of thing when it depresses our own revenue for residuals, it is only human in business matters to take advantage of opportunities. This competition consideration alone would, in many cases under certain conditions, compel the repudiation of Mr. Allan's contention that, owing to the enhanced price received for coke due to the consumption outlet created by the water-gas plant, "it is "only fair to water gas, when comparing its cost with coal "gas, that the charge for coke should not be included in its "manufacture." If the contention were accepted by others, it could only fairly apply at certain exceptionally favourable periods of the year; and, at any rate, it would be unfair to coal gas—particularly when there was a good demand for coke and high prices generally ruling, through abounding trade or other fuels being at high cost—if the market value of coke absorbed by the water-gas plant were not deducted with the remainder of the coke from the cost of coal, before arriving at the net manufacturing cost per 1000 cubic feet of coal gas. With regard to the calculated saving that was effected last year, during the abnormal period of high prices for coal, through the agency of the carburetted water-gas plant, it would be interesting to have a similar calculation by Mr. Allan for a year during which the price of coal was about normal; and such years are more general than abnormal ones. These are only side-issues from the main question, upon which a very good case is submitted by Mr. Allan. The paper, it may be predicted, will be an influential one in the guiding of opinion.

It is useful to have a variety of experiences in regard to the conduct of any branch of such a manifold business as that of a gas undertaking; for while most, if not all, of us may nurse the belief that our own way of doing things is the best, it is often discovered that, in some particular, others have found a better way. A variety of experiences is therefore of value, as from them, combined with our own, the most efficient system of business method can be constructed. For this reason, if for no other, the paper by Mr. Morfett, of Sunderland, is welcome. In working up the prepayment system in that town, the area of supply was divided into districts, and canvassed; and the paper shows how successful this was, in the instance quoted, in obtaining orders and in saving labour and time in the work of connection. The question of prepayment meter robberies is also of increasing importance. The ease with which these meters of the ordinary form can be plundered with success, appears to have a more potent influence for evil than has the conviction of the depredators who are captured in acting as a deterrent. Of this fact sight should not be lost. Those who suffer most from these robberies are, of course, the meter owners; for not only is there the loss of the coin in the meter, but as the paper shows, assuming the average haul per meter is 5s., the average cost of disconnection, repair, and reconnection is of almost equal amount. The gain to the plunderer is, therefore, in loss to the meter owner nearly doubled. The value of fairly frequent inspection among the prepayment meter consumers has also an excellent two-fold influence. It prevents the abuse of the fittings and stoves, and has, consequently, a beneficent effect on maintenance charges, and on cultivating an increased consumption of gas. The usefulness of the file system in keeping the records of the prepayment meter system is also illustrated in the paper.

The Appeal to the Plant Manufacturers.

THE Gas-Engineering Section Committee of the Franco-British Exhibition last Friday (as reported elsewhere) made their final attempt to rally the gas-plant manufacturing firms to their aid; but we fear with little success. And it may be said at once that better will it be for the dignity of the gas industry, rather than have merely two or three pieces of plant, or even half-a-dozen stands containing plant, to "represent" the great engineering section of the industry, to present to the gaze of the world only the well-defined exhibition of the uses of gas that the Committee are so creditably organizing. It cannot be pretended that we entertain any very great sympathy for this eleventh hour movement on the part of the Committee. If the Committee had originally sincerely required the gas-plant manufacturers to come in, the *vis-à-vis* meeting that took place on Friday would have been held six or seven months ago; and representatives of the manufacturing firms would then have been elected to the Committee, and co-operated in the organization of the section. It must be recognized now that the times have changed, and with the times conditions; and a big representative gas exhibition will never, and very properly, be possible now and in the future without a Joint Organizing Committee of gas engineers and gas plant and appliance manufacturers.

That is a *sine quâ non* of the situation. And an equally important condition is that the gas-supply industry shall in the future share in the expenses, the weight of which is not even yet appreciated by many.

In this instance, the Committee is constituted entirely of gas engineers and three or four others closely identified with the gas-supply industry. The gas undertakings have alone, through the Committee, taken this matter in hand; and we had really hoped, after the appeals that have been made by and on behalf of the Committee, that from the gas-supply industry—an industry that employs an aggregate capital running to millions, and counting its receipts and customers by the million—something better than a paltry £3800 for a demonstration of this kind would have been forthcoming. The eleventh hour invitation by the Committee has, whether or not it is really so, rather the appearance of a desire for relief from a somewhat embarrassing position than for gas plant; and gas plant other than models has a good space-absorbing power, at so much per square foot. This criticism would have been utterly impossible if those who took the initiative in forming the Committee had called the manufacturers together in (say) August or September last, and had told them, through Mr. H. E. Jones, or some other spokesman, that "they had "in them all the spirit of the British trader and mechanical "engineer, and wanted to show the world what they could "do, and that here was an opportunity of doing justice not "only to themselves, but to the great industry to which they "belong." Recognizing such a spirit, the invitation might well then have been added, "Come and join us, and render us "both your help and advice." Instead, there has only been one earnest voice raised on behalf of the Committee at places where the plant manufacturers have met, asking their sympathy for the exhibition; and the letters from the Committee have contained but an indirect form of appeal to the plant manufacturers. The whole manner of going to work in this matter has been treatment from a distance; and only at the eleventh hour are the Committee and representatives brought together, and face to face.

Even on Friday the Committee had nothing of a concrete nature to propose to the manufacturing firms present; and there should not be displeasure if the manufacturers, straight off the reel, without any previous opportunity for conference, had nothing definite to suggest to the Committee. They were not by any means antagonistic to the Committee or to their suggestion for assistance; and we are sure that had the date of last Friday's meeting been in August or September last, the position to-day would have been altogether different. Again, it is hardly wise to boast, in the face of the plant manufacturers, of what the gas companies are doing, or have done, on this occasion. The £3800 is not a tithe of what the exhibitors spent from first to last over the Earl's Court Exhibition, without mentioning others, for which they have had to pay, and have paid without calling upon the gas-supply industry to meet them in the matter, although what they have done collectively and at a price has been not only in their own interests but, by showing the abilities and efficiencies of gas, in the interests of the gas-supply industry. It seems to be forgotten that rent and attendance are not the only expenses to which exhibitors are put. Just think of the labour and conveyance costs connected with heavy goods before they are installed in an exhibition, then the cost of space, attendance (skilled attenance is necessary in some cases), fitting up, lighting, cleaning, &c., and then repacking exhibits, cost of transference back to works, and overhauling again before they are fit for sale. There are few who appreciate all these outlets for expense in connection with an exhibition on the part of manufacturers; and we think that, when there is further reflection, it will be admitted that the smile at the desire to economize in the charge for space by a shilling or two per square foot has not much other than ignorance of the facts to vindicate it.

After all, at an exhibition of this kind (with the popular side carrying the heaviest weight of attraction), what have gas plant manufacturers to gain? They have no business relations with the greater number of the 40 to 50 million people who are "expected" to go to Shepherd's Bush (which number we are inclined to think is an altogether too generous estimate, in view of the fact that the latter figure means maintaining an average daily attendance throughout the exhibition of above 320,000); and though the Institution of Gas Engineers and members of the Société Technique will be visiting the show, there are cheaper means of advertising among them what a firm has for sale than by sending goods to Shepherd's Bush. If the Committee are desirous of having gas plant on view to justify the title of Gas Engineering Section, there are manufacturers who would willingly go to the expense of providing plant by invitation, pay for its carriage to Shepherd's Bush, send skilled men to erect it, and, on the occasions of special visits of engineers, to explain its features and working, if the gas-supply industry would take their share of the expense by providing the space. The Committee would then have the right of selecting the most novel plant, allocating it any position they pleased—in fact, take the entire direction, as they are now doing. Inasmuch as the Chairman of the Committee says that an exhibition which tends to advertise and promote the interests and trade receipts of any particular firm cannot be made the subject of a free grant of space, the above suggestion will no doubt be scoffed at; but there was no scoffing when the boot was on the other leg—when the manufacturers bore the whole of the expense of advertising the utilities and efficiencies of gas, as well as their own productions, and promoted the interests and trade receipts of the gas-supply industry. The Committee have done something in getting a reduction of expenses at the exhibition for any display individually or collectively that the plant manufacturers like to make; but for such an exhibition something more should be done.

However, we should be sorry if any plant manufacturing firm favourably considering the question of exhibiting were in any way persuaded from their intention by what is written here. Our greatest disappointment is that the gas-supply industry have not come forward with funds sufficient to have enabled their own Committee to run the display with freedom on this occasion, and to have made their own selection from an invited offer of models and plant to illustrate the modern engineering achievements of the industry.

A Survey of Gas Promotions and Opposition.

The House of Commons reassembled yesterday; but the House of Lords indulge in another week's respite from their labours. The reassembling opens another chapter in our national history; but the policy of the recent past is to be continued. However, the time is suitable for briefly drawing attention to the position of the Gas Bills that are being promoted this session. Their fewness and, on the whole, mediocrity have already been remarked upon when dealing, a fortnight since, with the general legislative work of the session and the other current changes affecting, and possessing interest for, all industries. At the beginning of the session, there were only seven gas measures in which new companies desired incorporation, or by which limited companies desired to be elevated to the statutory state with extended powers. Of these seven measures, two—the East Metropolitan Power Gas Supply (the Coalite Company's measure) and the Greystones Gas Bill—have been withdrawn. Of statutory gas companies seeking enlarged powers, there were eight; so that of Gas Company Bills there were, all told, only fifteen introduced, and thirteen of these have survived, with more or less success, all the ordeals through which they have so far passed. Of the thirteen, there have been eight that have been opposed before Select Committees; and some of them have been considerably defaced since they were originally deposited. It is not anticipated that more than perhaps two or three will be opposed in the second House; already threatened with further hostility being the Draycott and Llanelly Bills. There were nine Municipal Bills that originally contained gas clauses. The ratepayers of Widnes, however, vetoed the proposals as to gas profits in the Corporation measure; so that now there are only eight in this class embracing a few gas clauses.

The Draycott Bill has been the fighting measure of the session; the Long Eaton Gas Company contending for a continued tenure in a district long neglected by them, but served for a great number of years, with satisfaction to all concerned, by the Draycott Company. Both Companies hold concurrent powers; but there has not been concurrent operation. The Draycott Company, it will be remembered, succeeded in obtaining the sympathy of the House of Commons Committee, as they are very confident of doing in the House of Lords. The methods of the Long Eaton Gas Company in trying to force the Draycott Company to the wall have brought disfavour (which they find some difficulty in shaking off) upon them and their appeal for retention of supply powers in the district in question. The Bromley Company's Bill for amalgamating the Crays Company is going forward; an agreement having been arrived at with

the authorities by which, so long as the differential price for gas in the Crays area is more than 3d. higher than in the Bromley district, the existing Bromley dividends are not to be increased. As there is an agreement with the Bromley Corporation that the price in the Crays area is not to be less than 4d. higher than in the Bromley district for five years, the effect is practically to suspend the operation of the sliding-scale for the quinquennium. The Swinton and Mexborough Gas Company (who have hitherto been working under a Provisional Order) have had a purchase clause put into their Bill; indifferent management having provided a strong case against them. The Llanelly Gas Company have had the proposals in their Bill clipped down very considerably; enterprise not having been the forte of the direction in the past. In the case of the Gosport Gas Company's Bill, the amount of the carry-forward has been limited to the equivalent of a year's dividend. The electricity power scheme for Ireland, in which the generating power was intended to be derived by the gasification of peat, was rejected as being nothing better than a phantom of practicability.

Concerning miscellaneous matters, during the session the auction clauses have been remodelled; and the "not below "par" restriction for new issues has been annulled. An announcement has been made that the renewals fund clause is to be dealt with by the Lord Chairman in some form or other; but it is hoped that this useful provision for consumers as well as for companies is not going to be completely sacrificed, or rendered nugatory. The Blackburn Corporation in their "Omnibus" Bill sought to bring consumers laggard in payment for either gas or electricity to their senses by having the right to refuse them a supply of either or both commodities for any premises in the borough or district in their occupation. The Police and Sanitary Committee decided that the powers of both departments must be exercised as though the businesses were run by independent persons. As we have before observed, it is a pity, in the interests of communities, that the independence of all municipal trading concerns is not more strictly defined. The Barnet and Southgate Gas Companies endeavoured to prevent the Finchley Council getting powers to supply electricity in a small area outside their administrative district, but were unsuccessful, though they made out a good case regarding the inexpediency of allowing a commencement to be made in municipal trading in an area in which the authority have no governing powers, and therefore any loss in the area would fall upon the ratepayers in the Council's administrative district. But the Police and Sanitary Committee are at present dominated by members with a distinct leaning towards progressivism and municipalization, and they could not see any incipient danger in the proposal. The Gas Companies have yet the House of Lords to which to make appeal. The London electricity schemes have not yet made any substantial advance on their Parliamentary course. The Lords wanted a Joint Committee of the two Houses to deal with this complex matter; but the late President of the Board of Trade was unfavourable to this course, and suggested that there should be a preliminary conference between all the parties concerned in the question, in order to see whether some scheme finally solving the vexed problem could not be at once launched on smooth waters. The prospect is, however, that the Bill will now come in the ordinary course first before a Committee of the House of Lords.

Depreciation and Renewals.

THE paper on "Depreciation and Kindred Matters" which Mr. C. H. Armstrong read at the North of England Association meeting on Saturday contained many points. But what the author had to say upon them he said well; and careful reading of his paper does not disclose a single slip in his statement of the facts relating to the position of the rights and powers of gas companies in the matter of meeting, or making provision for, depreciation. Mr. Armstrong has studied his subject thoroughly, and has a full grasp of the extent of companies' privileges in regard to it, as well as of the necessities. He points out what is very evident, that there exists a great deal of confusion in the minds of many gas officials as to whether or not it is illegal to provide for depreciation in addition to the regular specified funds. It is to be feared that the minds of gas officials are not the only ones in which there is confusion, perhaps not so much on the question of legality as on the question of the expediency and the economic and other value attaching to provision for depreciation and renewal. Such confusion appears to be reigning at the moment in the minds of the parliamentary authorities at Westminster. But there is no confusion in the minds of high financial authorities as to the soundness of the policy. Without special statutory authorization, no gas company have the specific right to provide a depreciation (or renewals) fund, other than for works on leasehold lands. In those cases where a special renewal fund has not been asked for and obtained for gas-works, Parliament has not (to use Mr. Armstrong's words) specified any direct provision or guidance for depreciation, with under the General Acts the exception above mentioned; and this absence of specification "implies "that ordinary depreciation, replacements, and displace-"ments by extraordinary extensions are to be met by some "means or other through revenue." But the "some means "or other" must not (if only the canons of the statute books are observed) be by the open accumulation of funds year by year. Proofs of this are the specific provision for works on leasehold lands, and the closing words of the model reserve fund clause for sliding-scale companies—viz., "save as in "this Act provided, no sum shall in any year be carried by "the Company to *any* reserve fund." As a reserve fund has just been provided for before these words, the three final ones, "any reserve fund," have a signification that cannot be avoided.

The renewals fund clause in Private Gas Acts, which is the equivalent of a depreciation fund, is quite a modern innovation; and though it has been accepted by Parliament in several cases, the authorities have not yet seen fit to adopt it as a model provision. Their hesitancy, and now the threat to modify—perhaps entirely to refuse—the clause, cannot be understood. It is an economic and protective provision; and the appropriations up to 1 per cent. on the capital expended, with a limit to the maximum of 10 per cent., form a provision that would prevent any undue drain upon the revenue account in years in which there has to be large expenditure on replacement, and so tend to maintain the lowest possible price to the consumers. In the case of sliding-scale companies, the insurance fund and the reserve fund have replaced the old "reserved" fund of the Gas-Works Clauses Act of 1847. The insurance fund, for extraordinary occurrences, is however, the only one that draws direct on the revenue; the reserve being taken from the profits divisible among the shareholders. This being so, the appropriations permitted by Parliament where the renewals fund has been granted cannot be regarded as an undue or improper drain on the revenue; more particularly as, whether there is this special and uniform provision for renewals, or erratic enlargements of the items of repair and maintenance for the like purpose, it comes to the same thing in the end. But the prevention (by the accumulation of funds during the period the plant is undergoing depreciation) of extraordinary enlargements of the charges for repairs and maintenance commends itself as an economic and wise financial proceeding—more so even than the placing of such expenditure to a suspense account, the desire to get rid of which as quickly as possible may be detrimental to the consumers by deferring reductions until the account is extinguished. The conclusion that the appropriations granted in recent years in certain cases are not excessive can be drawn from Mr. Armstrong's paper. He urges a systematic charging of depreciation on account of the subjects of a gas-works during their life, and the keeping of a special ledger for the purpose. He takes a concrete example of a plant producing 450 million cubic feet of gas per annum; and it will be seen that, on the varied life of the manufacturing portions of a gas-works property—each part requiring its own percentage charge per annum—that the average appropriation required on the total capital expenditure works out to close upon $2\frac{3}{4}$ per cent. Therefore, the maximum allowance that has been made in several Acts of late years of 1 per cent. on existing capital expenditure representing the whole of the assets, with the total of the appropriations limited to 10 per cent., cannot be alleged to be unduly high.

The paper contains many points of interest and of far-reaching importance in connection with sound financial administration; but pre-eminent in importance is this question of renewals and depreciation. It has been charged against gas companies by one authority that, in the reduction of capital expenditure per million cubic feet, they are being outstripped by municipal undertakings. It has been contended in these pages that the position, all things considered, is not so bad as it was attempted to make out; but, at the

same time, the very best methods, under a distinct order of things, should be adopted to keep the capital account at the lowest level, consistent with enterprise and economical working result.

A Gas Company's Emergency Department.

The advantage of being ready for any emergency, no matter in what position one may be placed, is too generally acknowledged to need emphasizing. This condition of readiness is of special value to the fire-brigade superintendent and to the manager of gas-works; for delay in dealing with an outbreak of fire or with an escape of gas may involve great destruction of property and even sacrifice of life. It has been said, and probably with truth, that there have been few large fires which could not have been prevented by the application of a few buckets of water at the very outset; and there is no doubt that the prompt attention, by a skilled artificer, to an escape of gas, which had made itself evident by its unmistakable odour, might have obviated explosions, and prevented the publication of many a sensational paragraph. It is of the highest importance that complaints of escapes should be attended to, as we believe they invariably are, at the earliest possible moment after they have been received. Where a company's district is a large one, some delay must necessarily occur in reaching the locality from which the complaint proceeds, unless district stations have been established; but with the modern means of rapid transit, it may be reduced to a minimum. In view of the importance of this department of gas suppliers' business, attention may be directed to the account given in another column of the arrangements made by the Consolidated Gas Company of New York for dealing with accidents, fires, or complaints of leaks. Their "Emergency Department" is a large affair; but the Company's district is also large—occupying an area of 22 square miles, in which are 1425 miles of mains, 150,000 houses, and upwards of 600,000 meters. It is claimed for their system, which was introduced by Mr. C. C. Simpson, the Company's General Superintendent of Distribution, in 1900, that it affords a means of promptly rectifying, at any hour, defects in, or disarrangements of, the consumers' house piping, fittings, or appliances, over which the Company do not ordinarily exercise control; and that the work done in its eight years of operation has conclusively demonstrated its value. Though the equipment of the department may seem unnecessarily elaborate for some of that work, it nevertheless bears evidence of a desire to protect the public, as far as possible, in the use of the Company's commodity.

Practising Economy at Acton.

It is, of course, always much easier to add to expenditure than to curtail it—both in the case of private individuals and of public bodies. But, nevertheless, a time does sometimes arrive when the situation has to be faced, and it becomes absolutely necessary to put into practice that study of economy which is so much more often preached that it is practised. At such a stage, seemingly, have the Acton Urban District Council arrived; but, to their credit be it said, they have faced their difficulties boldly, and (to somewhat mix one's metaphor) have vigorously applied the pruning knife and cut their coat according to their cloth. In other words, a determined effort has been made to keep the general district rate within what must perhaps in these days be regarded as reasonable bounds, though even the figure fixed upon for the present year—4s. in the pound—when added to a poor rate of 4s. 5d., constitutes a formidable burden for both private individuals and traders to bear. The Council are fortunate in having in Mr. H. S. Schultess Young a strong Chairman, who makes up his mind as to what is the best course to adopt, and then pursues it, without turning either to the right or to the left. In his suggestions for cutting down, on a somewhat wholesale scale, the estimates of the various Committees, he has carried the majority of the Council with him, though there was some protest raised. Whether such protest was justified in any direction, time alone will show; but in one instance, at least, it is safe to say straightaway that nothing but advantage will result from the lopping process—and that is in regard to the determination of the Council to revert to gas lighting for the public streets. Electric street lighting (even though it is carried out by means of a municipal undertaking) has been found at Acton, as elsewhere, an expensive luxury, as will be seen by the Chairman's statement that, by simply reverting to gas for street lighting, the Council could save annually a sum of about £1135. The present charge for public lighting by electricity is no less than £1780; and the Brentford Gas Company, after negotiations between the Chairman of the Council and the Manager (Mr. Alex. A. Johnston), made an offer which will provide the district with better lighting—and without the Council being bound for any definite period—at a cost of only £489 a year, instead of the £1780 at present paid for electricity. With these figures before them, the Council could not afford to support their own Electricity Committee and to ignore the enormous advantage offered them by private enterprise in the shape of the Gas Company. Various suggestions were made to reduce the electric lighting estimate by halving the number of the lamps, and putting out those that remained an hour or two earlier than at present; and the Chairman of the Electricity Committee spoke pathetically of the "serious blow" it would be to the undertaking to cut off from it the public lighting. But it was all of no avail; and Acton, by going back to gas under the circumstances recorded in our news columns to-day, furnishes one more instance of the recognition, after practical experience of both systems, of the economical advantages of gas over electricity. "Patronize your own shop" may be good enough advice under some conditions; but municipal electricity at Acton is emphatically a case in which it is not "good business" to do so. The Gas Company are to be congratulated on having scored the success which their very fair offer deserved.

Motor Buses and Lamp-Posts.

Public lamps have suffered much in London since the motor buses took possession of the streets. They are the last comers; but they are the first in tyrannical use of the roadway. In connection with them one of the latest pieces of information is that Mr. Justice Ridley and a special jury in the King's Bench Division of the High Court have said that these buses may even skid along the road, and knock down lamp-posts, but, if there is not negligent driving, the owners of the lamp-posts cannot recover, from the owner of the motor bus, the damage done. It is a very strange dictum that injury can be occasioned to property by a vehicle that introduces fresh danger, and, unless negligent driving be proved, the damage must be smilingly borne by the owner of the unoffending property. The case is of importance; and we hope the City of London Electric Light Company, who were the plaintiffs, will not allow it to remain where it is. The defendants were the Vanguard Motor Bus Company; and twice in June last their motor buses attacked an arc lamp on a refuge in Threadneedle Street, and did damage for which the Electric Light Company claimed £75. The plaintiffs alleged nuisance, in that the buses were not built and driven so as to avoid skidding; but the defendants submitted that, as the buses were sanctioned by law and police, they were not liable when there was skidding through the slippery nature of the roadway. The jury tried to look kindly on both parties—deciding that motor buses are not a legal nuisance, but, as there was evidence of negligent driving in one case, they considered that the Electric Light Company were entitled to damages amounting to £43. The possibility of an appeal is reported; and it is to be hoped it will come off, as the point has become a serious one for companies and local authorities owning street-lamps. Hitherto in County Court actions, the motor omnibuses have been held responsible for the results of their freakishness; but that, it may be expected, will be so no longer, except where negligence is proved, if the decision of Mr. Justice Ridley and the special jury is not successfully challenged. But since this case was heard, his Honour Judge Edge and a jury, have had one before them, at the Clerkenwell County Court, in which the Islington Borough Council have recovered £30 5s. damage caused by the alleged negligence of one of the motor bus drivers of the London Road Car Company. In this instance, not only were the standard and lamp broken, but the cable was fractured. The jury found that a motor omnibus is dangerous to the public using the highway, and is likewise a nuisance.

An Elective Auditor on Municipal Affairs.

From time to time discussion arises with regard to the position and duties of elective auditors which shows that considerable difference of opinion exists upon this subject, as is the case

with most others. But however much variation there may be in the views held as to the precise usefulness of the services rendered by these representatives of the ratepayers, there is no doubt that many of them take their work quite seriously, and are the means of securing the ventilation of questions which are of interest to those who elect them. Among these may be included Mr. Samuel Hardman, the Elective Auditor of Southport, who has lately been carrying on an active campaign in the columns of the local Press against what he regards as errors in municipal finance. To his mind, the auditorship of municipalities should from time to time pass into fresh hands; the post should not be entailed on one firm, no matter how eminent. What is wanted, he contends, for the assurance of the ratepayers is a change of auditors, so that municipal finance should meet with the impact of fresh minds —some of the men accustomed to handle the figures of the great private firms, who know the importance of writing off and the meaning of depreciation, who can distinguish between sound profits and fictitious profits and the false increase that follows upon the unhealthy stimulus of easily acquired capital. Mr. Hardman, however, does not confine his energies to dealing with the question of the auditing of municipal accounts in general or the condition of Southport finances in particular, but on occasion travels farther afield. One of his latest letters to the Southport paper is headed "Municipal Trading and the Association of Municipal Corporations;" and in it he draws attention to the powerful influence which municipalities have at their command through the Association, in favour of or against a particular parliamentary measure. The effect of this, he says, can be readily imagined; and the manner in which municipalities are favoured over companies in the tramway field is self-evident. "If," says Mr. Hardman in the course of his condemnation of present-day municipal methods, "the various corporation electricity works were capable of holding their own in the stress of scientific and commercial necessities and developments, why do we find the corporations and the Municipal Corporations Association persistently opposing every scheme that is being brought into Parliament for the distribution of electricity on a large scale? If ordinary traders are content with the ordinary standard of justice to be obtained from the Courts, why must the municipal traders have the special privileges of the Public Authorities Act and the intervention of the specially-whipped borough members to deliver them from the decisions of these tribunals?" He goes on to remark that municipal traders have forsaken the standard of industrial and financial success, and adopted instead the shelter of legalized monopoly and compulsory subsidy. Mr. Hardman has a forcible manner in expressing his views; but then those who argue on the other side are at times quite as strong in their statements.

M. Marquisan, the Treasurer of the Société Technique du Gaz en France, who, it may be remembered, was present, as representing the Society, at the meeting of the Institution of Gas Engineers in Dublin last year, was recently in England inspecting the latest systems of carbonization; and at the meeting of the Society of Civil Engineers of France next Friday, he will submit a paper on "New Methods of Distilling Coal for the Manufacture of Gas."

According to the "Journal de l'Eclairage au Gaz," proceedings have been taken to annul the patents held by the English Company registered under the title of "Buisson Hella and Gas Methane." The legal functionary who has the matter before him has therefore commissioned three experts—M. Violle, a member of the Academy of Sciences and one of the professors at the Conservatoire des Arts-et-Métiers, M. Wyrauloff, a professor at the Collège de France, and M. Lauriol, Director of the Lighting Service of the City of Paris—to report to him on the subject of the inventions concerned. It will be interesting to know their opinion on the matter.

The annual report of the Roads Improvement Association (Incorporated) for the past year has been issued. It gives a summary of the results of the road-tarring trials conducted last May, as well as particulars of some of the other methods the Association have adopted to deal with the dust problem. The conferences of road makers and users held in April and June are reported, and reference is made to the future programme in connection with them. The need for an Imperial grant for road purposes and a Central Department to administer it is emphasized. Instances of the successful efforts of the Association in regard to local complaints are given, and also particulars of the International Road Congress to be held in Paris next October (noticed in the "JOURNAL" for the 31st ult.), in which the Association propose to co-operate.

THE FRANCO-BRITISH EXHIBITION.

Guarantee Fund for the Gas Engineering Section.

WE have received from Mr. James W. Helps, the Hon. Secretary of the Committee having charge of the arrangements for the Gas Engineering Section of the Franco-British Exhibition, the following further list of contributions promised to the guarantee fund:—

COMPANIES.	£	s.	d.
Imperial Continental Gas Association	100	0	0
Chester-le-Street and Pelton	25	0	0
Chigwell, Loughton, and Woodford	21	0	0
Kingston-upon-Thames	21	0	0
Richmond	20	0	0
Hampton Court	10	10	0
Scarborough	10	10	0
Watford	10	10	0
Wellingborough	5	5	0
Chester	5	0	0
Jersey	5	0	0
Chertsey	3	3	0
Leighton Buzzard	3	3	0
Louth	2	2	0
Ross	2	2	0
CORPORATIONS.			
Manchester	50	0	0
Stockport	5	0	0
	299	5	0
Amount previously acknowledged	3521	16	0
	3821	1	0

ELECTRICITY SUPPLY MEMORANDA.

Private Lighting and the New Lamps.—Difficulties of Making up Consumption Loss.—Superior Recuperative Position of Gas Undertakings.—Revenue Loss per Lamp.—The Remedy.—Raising Charges at Brighton.—An Indirect Rate-in-Aid.

THE revolutionary tendency of the metallic filament lamps upon the electric supply industry is the most disturbing question with which central station engineers have had to deal ever since the incandescent gas-mantle came along and wrested from them the haul (from the flat-flame gas-burner) of business in illumination of which they had made almost certain. They are to-day faced by these internal dual and antagonistic conditions: On the one hand, without the intervention of the metallic filament lamps, the average income per unit of electricity sold is on the continuous decline through the low prices (which do not include all that is fairly chargeable) for power and heating; and, on the other hand, the metallic filament lamps have already shown their power of reducing the electricity demands of lighting consumers —the pack-horses of electricity undertakings—to such an extent that some of those who contributed an amount of profit before are rendered now almost unprofitable through the lowness of their electricity accounts and the comparative largeness of the capital and general charges which they involve from generating plant to meter. There is no doubt about there being an uncomfortable feeling abroad among the managements of electricity undertakings; and already there is searching around to see what can be done to arrest a leakage that is continuous and inclines to grow in volume. This feeling is reflected in a paper on "Electric Supply Prospects and Charges as Affected by Metallic Filament Lamps and Electric Heating," that Messrs. H. W. Handcock and A. H. Dykes have recently read before the Institution of Electrical Engineers, as well as in the remarks of certain speakers in the discussion. But the curious thing is that, in considering what course can be taken to stop the decline in income from the dual causes referred to above, some central station engineers are deliberately setting themselves to see what can be done to make the lighting consumer pay as much as before for the lower consumption, but for an improved light. In other words, they are disinclined to see the pocket benefits of the improved lamps being divided between the consumers and the lamp makers, while they are the sufferers alone. It is a very selfish attitude. The central station engineer has no control over the lamp maker, and so perforce he must, if he is not to lose revenue, attack the lighting consumer, who has borne the burden, and gets no credit for it, during the establishment of the electricity supply business. Never a thought does the central station engineer give to an alteration in the charges of the power and heating consumers—the latter of whom only does business when the paying lighting business is at its peak heights. The power and heating consumers are comparatively modern acquisitions; and upon them are showered favours—whether, from the nature of their business, deserved or otherwise. Every one of them should surely be made to pay a sufficient sum to return at least a narrow margin of profit on the electricity he uses, after all charges are met. The metallic filament lamp may be the means of bringing central station engineers to their senses on this matter. But in justice to Messrs. Handcock and Dykes, be it said they are not (their paper shows it) of those who would favour one class of consumer to the disadvantage of another.

In their contribution, the authors, considering the probable

reduction of consumption due to the metallic filament lamps, point out that, if the consumption be reduced by (say) one-third, it is not sufficient to increase the number of consumers by 50 per cent., as this would only just keep the output at its former level, without allowing for increased capital outlay on services and increased expense for meter reading and general administration. This indicates the big task that the metallic filaments may impose on central station engineers; and really it is extremely improbable that there are many districts where the number of lighting consumers could be quickly doubled. Therefore the authors have good reason for viewing the arrival of the 200-volt metallic filament lamp as most serious for a large number of electricity stations in residential districts dependent almost entirely upon current sold for lighting. They speak of gas undertakings having received a severe check from the incandescent mantle; but they recognize that, from the very nature of the business, electrical stations, so far as ability to withstand a reduction of receipts is concerned, are in worse case. They also recognize that, synchronously with the consumption reducing influence of the incandescent mantle, the gas cooker and heater and, through cheaper gas, the gas-engine (gas being supplied for cooking and heating at the same price as for lighting) began to be adopted at a rate that brought something more than compensation. But the electricity industry cannot look to anything having a like influence, in view of the expense of electrical apparatus, the costliness of electrical heating, and the already heavy expense of an electrical installation. Expenses and income of electricity stations, they show, do not compare at all well with a gas undertaking. The Board of Trade returns indicate that, whereas to obtain a gross revenue of £1 per annum a gas-works has to lay out £4 10s., an electrical undertaking must spend £7 10s.; and, while the ratio of working expenses to receipts is 75 per cent. in the one case, in the other it is 46·3 per cent. This means that an electrical undertaking requires a much greater margin than a gas undertaking between gross receipts and working expenses, for these reasons: (1) It has to pay interest on a much greater capital outlay per £1 of gross earnings; (2) in addition to paying this interest, it is (in the case of company concerns) generally liable to be bought out for a nominal sum at the end of 42 years, and has, therefore, also to provide out of the margin for a substantial sinking fund. The two causes have really a cumulative effect, as an increase in the first increases the second. They also render loss of output a much more serious matter than to a gas company. Again, the average cost of a gas service is £1 to £1 10s., but an electric service (exclusive of meter) will not in most cases cost less than £5 to £6; while, if a supply be required for heating, it does not as with gas simply pass through the same meter, but additional expense must be incurred for separate meters and wiring, with incidental complications both to the supply station and to the consumer.

While it is generally agreed that the electricity suppliers are threatened with a loss of consumption and revenue and the consumer will gain in light and reduce in a measure his electricity account, through the newer lamps, there are two features of the change that have hitherto not been particularly noticed, or have not been presented in so effective a way as in a table in Messrs. Handcock and Dyke's paper. They are that the purchasing cost per lamp to the consumer will, for metallic filaments, be higher than for carbon filaments, and that the lamp maker will receive more from the consumer than he has hitherto done, while the electricity supplier will receive less. The lamp maker will not complain of this transfer of revenue, seeing that the metallic filament lamps are far more costly to manufacture than the old carbon filaments. We cannot do better than quote some figures from this table; and if readers will compare those in the column headed "Total Paid by Consumer, Including Lamp Cost," with those in the column headed "Total Received by Supply Company," they will see the confirmation of these points, and also the differences that the new conditions will, according to the authors' estimates, make in the receipts per lamp to the electricity suppliers. Quotation here, of course, does not imply acceptance of the figures as to the average consumption of these lamps. In all cases, the assumed life of the lamps is 750 hours.

Cost per Candle-Power-Hour and Percentage Saving with Different Types of Lamps.

Type.	Price of Lamp.	Watt Consumption.	Units Used during Life.	Price of Energy per Unit.	During Life of Lamp.	
					Total Paid by Consumer (including Lamp Cost).	Total Received by Supply Company.
Carbon, 8 c. p.	1s.	30	22·5	3d.	79·5d.	67·5d.
				5d.	124·5d.	112·5d.
Carbon, 16 c. p.	1s.	60	45·0	3d.	147·0d.	135·0d.
				5d.	237·0d.	225·0d.
Tantalum, 23 c. p.	2s. 9d.	40	30·0	3d.	123·0d.	90·0d.
				5d.	183·0d.	150·0d.
Osram, 8 c. p.	3s.	10	7·5	3d.	58·5d.	22·5d.
				5d.	73·5d.	37·5d.
Osram, 30 c. p.	4s.	40	30·0	3d.	138·0d.	90·0d.
				5d.	198·0d.	150·0d.

The loss, of course, to the electricity supplier will be considerably more than is shown here with the coming of metallic filaments that will stand a voltage of 200 to 240, as it will then be possible to displace two or three carbon filaments by one Osram lamp, and yet get an equal illumination.

What, however, is the remedy for monetary loss to the electricity undertaking? The authors only find one, and that is a complete overhauling of the system of charging for electricity. They submit that, if the consumer is going to save money, and the lamp maker is going to get a higher price for his lamps, then it is not unfair that the supply station should receive a higher price for its current, especially in the case of those concerns that supply a large proportion of current for lighting purposes, and with many connections that do not contribute a fair proportion of profit in view of the expenditure incurred in giving the supply. But why is it that, in the days of carbon filament lamps, there have been many who did not contribute a fair share to profits? It has been solely on account of the expense of lighting by this means, and the practice of economy by the use of other methods. The expense of lighting, too, in several undertakings has not been reduced by the taking on of unprofitable consumers for power and heating. If these latter paid a fair price, the lighting consumer would be taxed to a lower degree. Yet, in face of these conditions, it is proposed that the lighting consumers shall gain as little as possible from the new lamps. However, in the view of Messrs. Handcock and Dykes, the only satisfactory method of remunerative charging is one which is intermediate between the flat-rate system of charging for gas and the fixed rental of the water companies—in other words, a fixed rental in addition to a small charge per unit. Why, we cannot conceive. There is no other system of supply in which such complication of charging is inflicted as in the case of electricity. In gas we have flat rates, with, for considerable business, discounts according to the amount. In water supply, there is a fixed charge; but nothing beyond "per 1000 gallons consumed." The authors' proposal is not a new one. Their idea is, in effect, a fixed price per kilowatt of estimated demand, determined by the capital costs of the supply system, and a low charge per unit fixed by the production costs—no distinction (and this is the favourable condition) being made between lighting, power, and heating—thus simplifying wiring. One objection to this is that a "limit-indicator" would have to be inserted in every house, the function of which is to throw a resistance into the circuit, and thus warn the consumer, by a reduction in the brilliancy of his lamps, when he is exceeding his contract limit. Are there no means by which electricity can be supplied on usual commercial lines? Fancy a consumer when he is using more electricity than ordinarily through some adventitious circumstance—perhaps with his house full of visitors—being automatically reminded that he is exceeding his contract limit by a reduction of the brilliancy of his light! and yet desirous of maintaining a brilliantly lit house so long as his friends may be with him. There would be great resentment to this. Consumers would argue that their butchers, bakers, grocers, wine and spirit merchants, gas suppliers, and others put upon them no such unique embargo. If ever a book is written on "Humorous Methods of Conducting Business," the history of the electricity supply industry will furnish the author with several useful illustrations. Among the other methods is cheap electricity supply for those who do not use the supply between stated hours in the evening when the lighting load is at its height—the Edinburgh project. However, we do not really think that any departure from the system of flat-rates with discounts will ever largely tempt the Britisher to give his patronage to any commodity; and the history of the electrical industry ought to have long since proved this to the managers of electricity undertakings.

The discussion of the general subject of the possible effects of the metallic filaments, and the available means of circumventing those effects is useful; but there need, we think, be little fear that the change from carbon filament lamps is going to come with a violent rush. The amount of inertia that is found when any departure from custom is suggested, is really marvellous; and this, combined with the price of metallic filaments, will cause the change to proceed in a leisurely fashion. In regard to price, it is widely advertised that 750 hours constitutes the useful life of the metallic filament lamps. That is rather a laboratory figure than one to be relied upon as an average in daily use. Nor does it take anything into account but the life from the safe deposit of the lamps in their holders until the end of useful life. The breakages that are experienced before the lamps are fixed in their illuminating situation are not counted in the life average; but they decidedly reckon in the expense.

News has been received of more than one electricity undertaking that has been contemplating raising their prices owing to increasing costs and decreasing income, and whose present excuse is that the lighting consumer has the privilege now of reducing his consumption by the aid of the metallic filament lamps. The Corporation of Brighton are considering a revision of their tariff for electricity on lines suggested by the Electricity Engineer (Mr. John Christie). The Department can stand big deficits no longer. Each year the new electricity station has been going to work wonders; each year there has at the beginning been promise of a better state of things; each year ends with a considerable balance on the wrong side. Remedy, higher price. About which, this is what Mr. Christie callously has to say: "This will not operate harshly on the consumer who is now able to use electricity more economically, and to better advantage, by employing the higher efficiency lamps obtainable." Of course, the proposed change in prices to private consumers is quite right in view of the thousands of pounds deficiency year after year; and the

necessity for the consumers contributing another £4000 to £5000 a year to keep the undertaking they choose to patronize with a balance between income and outgoings. But the quoted remark of Mr. Christie, which is intended to be palliative, does not strike us as being altogether a reasonable one, inasmuch as it is difficult to see where the consumers are going to benefit by the higher efficiency lamps if they have to pay the price of conversion to and installation of these lamps, and on top of that a higher price for electric current. Mention of the higher flat-rate charges would have no particular interest for our readers; sufficient for them to know that Brighton has found, as other municipal electricity administrators have found, that they have cut their cloth without leaving sufficient for the seams. For street lighting it is meditated that the charge shall be increased from an average of 1·565d. per unit to 1·75d., which will make comparison with street lighting by gas-mantles so much the worse. By the way, we notice that Mr. Christie also proposes that the street lanterns (1548) which at present have two 8-candle power carbon filament lamps in them—a light just sufficient to keep people from knocking up against the columns bearing them—shall be fitted with two 16-candle power tantalum lamps. The extra cost of the tantalum lamps will amount to approximately £606; and a two 16-candle tantalum lamp under the revised tariff will cost about £3 1s. 4d. per annum. The Gas Company would give something considerably better than a 32-candle power light for £3 1s. 4d. per annum. The scheme of price revision shows how the ratepayers are to be made to pay their additional share by an indirect rate through the public lighting towards the support of this unprofitable municipal trading concern. Brighton being the birthplace of the maximum demand system, it is interesting to note that it is proposed to change the 7d. and 1d. to 6d. and 2d. for old consumers at present preferring this method of paying for their supply, and to compel all new consumers to come on only by the revised flat-rate. A discussion in the Council on the subject will be noticed next week.

"COALEXLD."

Looking at the above title, readers will be inquiring, What is "Coalexld?" The appellation suggests that it is a fuel that excels coal, in certain or all of its properties, for the purposes of the consumer. That in itself arrests interest; but when it is learned that this fuel is the old coke of the gas-retort improved by the chemical treatment of the coal, full attention will be commanded. The discoverer of the means whereby the value of the gas-retort coke is claimed to be greatly enhanced to the consumer—and there are gas engineers prepared to declare that a real success has been achieved—is Mr. James Jowett, of Bolton-le-Sands; and he has patented the process. What he wanted to attain was some simple method of treatment whereby in gas-works a smokeless fuel could be obtained (without loss of gas, or any interference with the other residuals) which could assert itself as the equal of "Coalite," and yet be far cheaper. He has found that by his treatment, by the application of a chemical mixture to the coal before carbonization, he can, and does, produce a coke free from all the objections that from time to time have been levelled, rightly or wrongly, against gas coke—the resultant coke being free burning in any ordinary household grate, practically smokeless, free from sulphur, and deleterious fumes are reduced to a low point. The heating power excels that of household coal or ordinary coke; fires made by it burn clear and bright; and the percentage of ash is small. There can be no mistaking the completeness for a fuel of this list of virtues. And every one of them, we have full assurance, can be confirmed by test.

It is a simple process this treatment with a chemical mixture. The quality of coal, of course, makes a difference to the quantity of the mixture that must be used to have the desired effects. For an average quality coal, about 1 oz. of the mixture must be used per hundredweight of coal charged into the retorts; the mixture being composed of 14 oz. of chlorate of potash, 6 oz. of saltpetre, ¼ oz. of permangate of potash—that is to say, 20¼ oz. in all for a ton of average quality coal. Mr. Jowett's tests have led him to give trial to the most indifferent classes of coal; and on the lowest grade coal he has handled, 36¾ oz. of the chemical mixture—24 oz. of chlorate of potash, 12 oz. of saltpetre, and ¾ oz. of permanganate of potash—was the quantity required to realize the benefits in the coke. The gas engineer's first inquiries will be, Does the use of this chemical mixture injure the quality of the gas, or depreciate the bye-products other than coke, and is it harmless to the retorts? To all three questions the inventor responds emphatically in the negative. What also, it will be asked, are the actions that are set up by the use of the chemicals within the retorts, which actions produce the beneficial results? That is a matter Mr. S. R. Ogden, the Engineer of the Blackburn Corporation Gas-Works, is going to investigate; and we hope to hear something more from him on the scientific aspect of the subject at a later date. Meantime, it may be said that the process has been tried at Blackburn by Mr. Ogden and by other engineers elsewhere—among them being Mr. J. Swan, of Ulverston. All, we are told, started their trials in a sceptical frame of mind; all, we are likewise informed, had the scepticism scattered to the winds before they had finished.

Mr. Ogden has not the slightest doubt about the improvement in the quality of the coke; and this is his own testimony on the point: "The coke is practically smokeless; it gives off less fumes, and is much hotter than either coal or coke; it will burn on any fire (either alone or mixed with coal); and it is for ordinary domestic purposes much superior and cheaper in every way. It has also been proved a decided success for engineering and blacksmiths' purposes, for which there is a willingness to pay more for it. The treatment, in fact, makes a poor coke usable, and a good coke better. It does not detrimentally affect gas manufacture in any way; but there is an appreciable decrease in the amount of sulphuretted hydrogen to be dealt with, according to, and varying with, the quality of coal employed. The cost of treatment is easily recovered by the increased value of the coke. One penny per cwt. extra, on yard prices, will cover all costs; but cases can be quoted *where 2d. and 3d. extra are being paid for the coke, and with growing demand for local sales.*" The coke produced in a 100-ton coal test, we understand, was sent out to half-a-dozen engineering shops where coke is used in the blacksmiths' forges; and from each quarter, their came a uniformly good report. A sample of the coke improved by the use of the chemical mixture on the coal carbonized has been forwarded to us from Blackburn through the courtesy of Mr. Ogden. It is a good hard coke; and although it has undergone the long railway journey, it is in excellent condition, in regard to cleanliness and freedom from dust.

No gas manager will refuse a welcome to an improvement in profits by increasing the value and sale of coke without increasing materially the cost of labour, and without interfering with the quality of the gas and the other materials. If by an expenditure of a penny, two or three pence revenue can be realized, well there is good business in it; and gas managers will desire to know something more about it. Caution is a well-developed characteristic of gas managers; and that is why we hear of few failures among them in their work. Therefore, notwithstanding the testimony of accrued experience, gas managers generally will, Mr. Jowett will find, look (like those who now attest merit did at the first) a little sceptically upon his patented scheme until they have given it a trial. To that end, it may be said that the process can be used, either by licence from the patentee, or by the purchase from him of the chemical mixture bagged ready for use. One great charm about a trial of the process is that no capital expenditure is required, and that the trial can take place at any time without in any way trespassing upon the ordinary operations of the works.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 244.)

The expectation that more activity upon the Stock Exchange would prevail after the holidays has not been realized, and business continues as stagnant as ever. This may partly be due to the Jewish holidays last week—causing some dealers to stay away—and to the settlement, which began on Friday. The only sign of animation has been in American Railways, which were advanced to aid the flotation of a large Pennsylvanian Railway loan in New York and Europe. Gilt-edged securities continue under the influence of various new loans, and the knowledge that a number of others will be brought out this summer. It is estimated that at least 20 millions sterling will be wanted. Under these circumstances, it is not surprising that stocks have been dull, as sales have to be made from time to time to find the requisite money. Consols have been very heavy, as a large block of stock was offered; and the price fell to 86⅝ money, 86⅛ account. Other first-class stocks were likewise depreciated, and dulness was the general characteristic; the severity of the weather accentuating the general feeling of depression. Money has been in good request all through the week, and more loans had to be obtained from the Bank of England, causing a firm tone in the Discount Market. Business in the Gas Market has been also on a very limited scale; the only feature being the active dealings and weakness in Gaslight and Coke ordinary on Thursday, Friday, and Saturday. The price has dropped two points, to 94-96; business being recorded from 97½ down to 94½. The preferred stock marked 107½; while the debentures changed hands several times between 84 and 85. There was a little business in South Metropolitan ordinary, at 122¾, 122, and 121. Commercials were steady; dealings being recorded at 107. Business in the Suburban group was fairly distributed. On Tuesday, Tottenham and Edmonton "B" rose 1, to 102-105, business being done at 104½ and 105; while the debentures marked 102. Dealings were also recorded in Brentford ordinary at 245 and 242, West Ham ordinary at 101½ and 101, and Bromley "A" at 118 and 117½. The feature in the Provincial stocks has been the rise in Liverpool "A" to 227-29; and the "B" stock likewise rising to 162-64. Newcastle and Gateshead debentures are also higher at 88-90. Bournemouth "B" changed hands at 16½, Alliance and Dublin at 19¾, and British at 42 1/16 and 42¼. The Continental companies were comparatively quiet. Imperial Continental was dealt in at 180½, down to 179½, exceptional business at 179¼, and the debentures at 93¼. European part-paid changed hands at 17, Tuscan at 10⅝ and 10⅜ free. Among the undertakings in the remoter world, River Plate ordinary advanced to 13¾-14¼; transactions being recorded at 13⅝, 13 11/16, and 14. Business was done in Buenos Ayres at 11⅞, San Paulo at 13⅝, Primitiva preference 5 at 99s., ditto debentures at 94¾, Bombay new at 92s. 6d., and Metropolitan of Melbourne debentures at 101¼.

"COLLIN" COKE-OVENS AND GAS RETORTS.

[COMMUNICATED.]

CARBONIZATION being the topic of the day in the gas engineering world, all technical readers of the "JOURNAL" must follow with peculiar interest the contributions to the subject which at the present time fall thick and fast in its pages. Among the articles which will have been read with interest, though it may not have been productive of conviction, is the one that appeared in last week's issue, in which the author gives "comparative figures in relation to bye-product coke-ovens and gas-retort plant for the benefit of those engineers who are ever on the alert for improvements and economy in their methods of manufacture;" and the article winds up with the pious hope that "the foregoing will be of some interest to engineers wrestling with the problem, 'How to make cheap and good gas with a minimum of trouble and expense.'" The conferring of benefit on mankind—mankind includes gas engineers—is a deed that deserves our most generous recognition and thanks; but the present writer is no doubt not the only one who has searched the article for the benefit to the engineers ever on the alert for improvements and economy, and has failed to locate an atom that cannot be realized by some more profitable mode of working. Nor can one see in the article where the author finds that which is necessary to buoy-up the hope that the figures will indicate to the gas engineer (better than anything ever seen before) how to make cheap and good gas with the minimum of trouble and expense. As a matter of fact, the author shows that the gas is not cheap, and that it is not particularly good. Besides, in wrestling with the problem of how to make "cheap and good gas" with the minimum of expense," it is not for the gas engineer to consider the question of a "minimum of trouble." If the "minimum of trouble" comes as a collateral advantage, then all praise and glory be given to the system that produces it.

The particular type of coke-oven that the writer of the communicated article pats on the back as being for the gas engineer the *sans pareil* among coke-ovens is the "Collin" inclined type. It matters not to the present writer what form of carbonizing plant comes along, what is its name, or who is the inventor—with him, the best will have favour; for him, the tests of superiority are found in working results and costs. The "Collin" coke-oven is put forward as something new, and as a system that will do remarkably better (according to the article, but not in fact) than present-day systems of carbonizing in gas-works. But it is contended that, had the writer of the communication compared the results of the sloping coke-oven with those published for verticals, he would have discovered a much stronger case against the "Collin" coke-oven than that which he has unconsciously submitted, while purposing to write in its favour. It is somewhat surprising that he did not make his working and cost comparisons with vertical retorts, seeing that he claims common advantages with them in superior quality coke, improvement in tar and ammonia products, freedom from naphthalene, and the action of the gas in selecting the path of least resistance, and a comparatively cool path too, and so escaping the objectionable "cracking" due to the large amount of heated surface to which gas is exposed in horizontal and inclined retorts in which there is a considerable area of free heated space.

In dealing with the calculations of the writer of the article, the base figures are going to be accepted without any criticism at all. They will serve the object in view. In trying to incline belief to the results of the "Collin" sloping coke-oven being superior to the ordinary system of gas-works retort carbonization, several figures as to ground-space occupied, and number of tons of coal carbonized, &c., are quoted; and a wrong deduction is made from them. These are the principal figures:

	No.	Coal Carbonized per Day. Tons.	Area Occupied. Square Ft.	Area per Ton. Square Ft.
"Collin" coke-ovens	30	240	3250½	13½
Gas-works retorts	10 beds of tens 20 ft. through.	160	2000	12½

The charges for the gas-works retorts are 8 cwt.; and there are four charges during the twenty-four hours. The tabulated figures show that the gas-works plant occupies 1 square foot less per ton of coal carbonized than the "Collin" coke-oven plant. Following on, it is found that the writer assumes a production of 10,250 cubic feet of gas from good Durham coal carbonized in the "Collin" sloping ovens; and 10,500 cubic feet per ton from the coal carbonized in gas-works retorts—that is to say, the latter produces per ton and for sale 250 cubic feet more gas. At the moment, it is not intended to criticize the lowness of the 10,500 cubic feet from good Durham coal—"lowness" as things go in these times. But taking the figures of the writer, we have—

	Coal Carbonized per Day. Tons.	Gas Produced. Cubic Feet.
"Collin" coke-ovens	240	2,460,000
Gas-works retorts	160	1,680,000
		780,000

The "Collin" coke-oven advocate deduces from these statistical premises that there is the greater yield of 780,000 cubic feet of gas from the coke-ovens than from retort plant "taking up the same amount of room." How he came to fall into this egregious error on such plain facts is really incomprehensible. Here we have for the installation of gas-retorts that he choses for comparison, a ground space occupied of 1250½ square feet less than the coke-oven plant. On his own showing, a space of 12½ square feet only is required per ton of coal carbonized for gas-retort plant, against 13½ square feet for coke-oven plant; and, moreover, the gas-retorts yield 250 cubic feet more gas per ton of coal carbonized.

Supposing, now, a little rectification of the figures be made, to see what happens. If ordinary gas-retort plant occupies 12½ square feet per ton of coal carbonized, then to carbonize 240 tons 3000 square feet would be required, or 250½ square feet less than for the coke-oven plant. The quantity of gas produced from the 240 tons, at 10,500 cubic feet per ton, would be 2,520,000 cubic feet. The comparison, therefore, stands thus—

	Coal Carbonized per Day. Tons.	Area Occupied. Square Feet.	Gas Produced. Cubic Feet.
Gas-works retorts	240	3000	2,520,000
"Collin" coke-ovens	240	3250½	2,460,000

In the order of merit, the first place is given here to the gas-retort plant; for while 250½ square feet less space is occupied, 60,000 cubic feet (on the low make of 10,500 cubic feet of gas per ton) more gas is produced for sale from the 240 tons of coal. Supposing, again, the gas-retort plant is given the 3250½ square feet occupied by the coke-oven plant, at 12½ square feet per ton, the area would allow of 260 tons being carbonized; and 260 tons, at 10,500 cubic feet of gas per ton, would yield 2,730,000 cubic feet, as against 2,460,000 cubic feet for the coke-oven plant, or 270,000 cubic feet more. Where, then, is the justification for the assertion that a "Collin" coke-oven plant will yield 780,000 cubic feet of gas more than a retort plant "taking up the same amount of room."

Again, still accepting the base figures of the author, he states that the cost of a bench of ten beds of ten retorts, with everything complete (except charging apparatus, coal-stores, foul main, &c.), will amount to £50 per mouthpiece, or equal to £62 10s. per ton of coal carbonized per day; whereas thirty "Collin" coke-ovens complete (with the exception of the charging apparatus, and discharging machine) would, it is estimated, cost £50 per ton of coal carbonized per day. The difference of £12 10s. per ton per day, the author of the article regards as very favourable for the coke-oven system. His contention looks plausible enough; but, as a matter of fact, is the lower capital expenditure a more profitable investment than the higher? The present writer maintains that it is not.

Gas retorts	240 tons × £62 10s.	= £15,000
"Collin" coke ovens	240 ,, × £50	= 12,000
Extra capital cost for retorts.		£3,000

It would be interesting, in view of the several ton charges to be dealt with in the coke-ovens, to have the comparative capital charges, including coal and coke handling plants.

In the previous paragraph, it was seen that the 240 tons of coal carbonized in gas-works retorts gave us 60,000 cubic feet more gas per day for sale than the 240 tons carbonized in the "Collin" coke-oven. This 60,000 cubic feet sold at 2s. 6d. per 1000 cubic feet would produce a revenue of £7 10s. a day which would be lost by carbonizing the same quantity of coal in the "Collin" coke-oven. Assuming the installation of ten beds of ten retorts worked for only 200 complete days in a year, the £7 10s. × 200 would equal £1500, or, if 300 complete days, the £7 10s. × 300 would equal £2250, and so on in proportion according to the number of complete days worked in a year. We have seen that the capital cost difference between the two systems (taking the figures of the writer of the article given last week) is only £3000 for plants dealing with 240 tons of coal, so that merely the £1500 gained from additional gas by only 200 days working in the year would pay 50 per cent. on this £3000, or alternatively wipe it out in two years. Where is the necessity for, or the use of, sacrificing money in this way?

Passing to the labour costs for the "Collin" coke-ovens, it is seen that the carbonization of 240 tons of coal requires 24 men, whose wages are in part 5s., 4s., and even as low as 3s. 6d. per day! The coal is estimated to produce only 2,460,000 cubic feet of gas. In the article on the Dessau vertical system published by Herr Körting in the "JOURNAL" for Jan. 14, he gave a concrete example of four men, with verticals, producing 1,236,000 cubic feet of gas; and later in the article he said: "I daresay that a production of 2,825,000 cubic feet with four stokers is within the reach of possibility." That would show a very big saving of men compared with the "Collin" system. Again, if comparison be made with the new methods of charging and discharging horizontal retorts, in cases where men and machines have full and free play, it cannot be said that the "Collin" oven has any ground for exultation in connection with labour; and, after what Herr Körting says, a much stronger case has to be made out for the "Collin" system before it can compete in this respect with the vertical retort.

The present writer will not make other comparisons between the vertical settings and the "Collin" sloping oven, beyond saying this: That vertical retorts to carbonize 240 tons will not cost more than horizontal or inclined settings; they will produce the advantages suggested for the "Collin" oven; will yield at least 1500 cubic feet of gas more per ton of coal of higher illuminating

power and of higher calorific value than the figures cited for the "Collin" oven working; and will give a better tar than in horizontal or inclined retort working, more ammonia, and assure freedom from stopped pipes and naphthalene. From 240 tons of good Durham coal when carbonized in verticals about 360,000 cubic feet more gas would be produced per day than in the "Collin" ovens; and this, sold at 2s. 6d. per 1000 cubic feet, would in the course of the year produce a revenue that cannot be set aside in considering "How to make cheap and good gas, with a minimum of trouble and expense."

But in addition to the statements criticized, the case of the writer of the article published last week is deficient in several important points. For example, he says nothing as to fuel costs, wear and tear, &c. Perhaps if he writes accepting or rejecting the amendments in this article, and the deductions from the calculations made, he will, at the same time, make good the omissions of his first article.

OPERATING CARBURETTED WATER-GAS PLANTS.

[COMMUNICATED.]

THE desirability of acquiring more information on the best methods of working carburetted water-gas plants has always appeared to the writer, and doubtless to others, to be a matter worthy of greater attention than that bestowed upon it by gas engineers—if we may judge from the scanty amount of matter published on the subject. The text-books for the most part give nothing more than a few elementary facts concerning the construction of the plants and their working. The papers read on the subject are few and far between; and even when they do appear, they are almost invariably devoted to the advantages of water-gas plant from the point of view of capital expenditure, the coke market, or of the great convenience to be derived from their use. The papers usually also contain a comparison of the respective cost of the manufacture of coal gas and carburetted water gas. All this information is, of course, very valuable; but it would be distinctly beneficial if an occasional paper were read on the details of the manufacture of water gas.

No figures are published giving information such as the following: (*a*) The amount of coke used per 1000 cubic feet of gas made, showing separately that used for generators and boilers; (*b*) the oil used per 1000 cubic feet; (*c*) the candle power per gallon per 1000 cubic feet; and (*d*) the amount of tar produced per 1000 cubic feet and per 1000 gallons of oil used. Such figures as these would be most instructive, and if they were included in published analyses could not but have a beneficial effect on the working of carburetted water-gas plants in numbers of works. Gas engineers have no means of checking their own results, to ascertain whether they are getting the utmost out of their plants—the natural consequence being that they have no alternative but to set their own standard. A careful study of the results obtained in other works is often the first indication that there is room for improvement in one's own works.

To mention a few points which are always deserving of close attention in the management of a water-gas plant. A well-known text-book contains a statement to the effect that the steam used must be superheated, or at high pressure—say, 130 lbs. per square inch; while a paper recently read in America, and published in the "JOURNAL," on operating carburetted water-gas plants, states that "the steam can be of any pressure, but it must be fairly dry." This advice is distinctly contradictory, and would be misleading to anyone who had not had experience of a water-gas plant. As a matter of fact, steam pressure of from 90 or 100 lbs. is capable of giving excellent results; while a temporary drop in pressure to (say) 80 lbs. or even 75 lbs. is often unnoticeable so far as the quantity and quality of the gas are concerned. So it would appear that the text-book's statement is unnecessarily exacting. At the same time, if the steam pressure shows a tendency to fluctuate, it signifies an insufficiency of boiler power, which is a great fault, and one often experienced, in water-gas plants. Plenty of steam at a pressure of at least 90 lbs. or 100 lbs. is the first desideratum. The volume and pressure of the air-blast is the next matter, and one which has no small bearing on the results. The text-book states that "air at about 13 inches of water pressure would be admitted, &c." The writer is not aware why this figure is mentioned; it is certainly a lower pressure than that worked in most plants.

The full significance of a good blast pressure is not sufficiently realized. It is this pressure of air which to a great extent governs the capacity of a plant—enabling it in some cases to be considerably enlarged. The truth of this fact is amply demonstrated in the Dellwik and the Kramers and Aarts water-gas plants. Let us consider the reason of the importance of the air pressure. It has often been shown that, in passing air through a deep layer of incandescent fuel, carbonic oxide will be produced unless there is a large excess of air, in which case there will be complete combustion to carbonic acid. It is the latter reaction which is required, but which is only partially obtained during the "blow" in carburetted water-gas plant. It is well-known that about three times as much heat is given out in the complete combustion of fuel to carbonic acid as there is in the partial combustion to carbonic oxide. Therefore, if the generator is to be heated quickly, it is absolutely essential for the combustion to be complete; and this cannot be brought about without a large excess of air. The writer showed, in a recent article published in the "JOURNAL," that during the first minute of the "blow" (with a Lowe plant) there was a large proportion of carbonic acid in the gases passing from the generator; during the second minute, the proportion was noticeably less; while during the third minute, the gases consisted chiefly of carbonic oxide with only a small proportion of carbonic acid. If the "blow" is then continued further for the fourth minute, the gases will consist almost entirely of carbonic oxide. Thus it may be assumed that the generator is receiving the bulk of the heat during the first minute, and proportionately less so long as the "blow" is prolonged. This shows why a shortening of the "run" and "blow" will often increase the yield of gas, enabling a proportionately longer "run" to be made, and a higher heat to be maintained, which, in its turn, will permit of a greater quantity of steam being used.

From the foregoing facts, the importance of a strong blast should be fully realized. Many works are in the habit of maintaining about 16 inches of pressure on their air-blast; but the writer contends that if this pressure be raised to 20 or 22 inches, the capacity of the plant will be considerably increased, and the quantity of coke consumed per 1000 cubic feet will be substantially reduced. With regard to the consumption of coke, it has been proved that the bulk of the fuel is used during the "blows;" so much so that one authority mentions that the proportion of fuel used during "blasting-up" is no less than four times that which is employed during the gas-making period. Therefore any curtailment of the "blow" should have a satisfactory effect on the consumption of coke provided that the generator is maintained at a proper heat.

There is one other matter which merits attention, and that is the depth of fuel in the generator. At many works instructions are given that the generator shall be kept full of coke, with the object that the blue gas made during the "run" shall be as far as possible devoid of carbonic acid. But this has the effect of defeating its own object; for it will obviously take longer to raise a large mass of fuel to a high heat than a quantity less by (say) one-third. The writer has found that the quality of the blue gas does not suffer provided the depth of fuel is not allowed to fall below about 6 feet; but a depth of 7 feet should preferably be maintained. The Lowe generator is constructed for a fuel depth of 9 or 10 feet; but in working this is found to be unnecessarily excessive, with the result that the air-blast must be prolonged, thereby shortening the gas-making period and wasting fuel. The makers of the Dellwik-Fleischer and the Kramers and Aarts blue water-gas plants have fully appreciated the principles which govern the capacity and the economical working of water-gas plants; for in each case the depth of fuel is shallow, and the air-blast is admitted at a very high pressure. Consequently the consumption of coke is about 30 per cent. less per 1000 cubic feet than is the case in the Lowe plants; while the capacity per square foot of grate area is, owing to the shorter time required to blast-up, vastly increased.

The largest item in the manufacture of carburetted water gas is the consumption of oil, which will usually amount to anything from 2 to 2½ gallons per 1000 cubic feet; giving an efficiency of about 7 candles per gallon per 1000 feet, where the gas is not being purified from carbonic acid. With oil at present price (about 3½d. per gallon) or even more in many cases, it will be seen that this item will alone account for from 7d. to 9d. per 1000 cubic feet made, as compared with a cost of 4d. or 5d. for coke (including boiler fuel), 1½d. or 2d. for labour, and about 1d. for wear and tear. Thus it will be seen that oil is the chief item; and it is consequently of supreme importance that the efficiency should be high in this respect. A few important points may be mentioned: (1) The sprays should be constantly inspected to see that the holes are not choked. (2) The oil should be admitted during the first two-thirds of the "run;" the remaining time being reserved for steam alone. This will effectually purge out the carburettor. (3) The gas in the outlet of the superheater should be constantly tested by allowing it to impinge on a piece of paper for a few seconds. If the paper is scorched, it indicates that too great a heat is being worked in the carburettor and superheater; if it is stained with a sticky or tarry deposit, it shows that the heat is too low. The proper appearance will show a yellow stain—neither sooted, scorched, or sticky.

The colour of the gas (unburnt) is a good indication of the heat in the plant. It should be neither white nor brown, but of a yellowish colour. If white, it shows that the gas is not properly fixed; if brown, that it is being overheated. It is a good plan to arrange for a small flame to burn on the outlet of the generator, close enough to the carburettor to catch the down-runs, and also on the outlet of the superheater. Each should be provided with a pilot-light, so that they will light up every run. In this way the quality of both the blue gas and the combined gas may be conveniently judged by those in charge of the plant. One more important point may be urged—the wisdom of regularly cleaning out the carburettor and scrubber. Either apparatus in a dirty state will seriously reduce the efficiency of the plant.

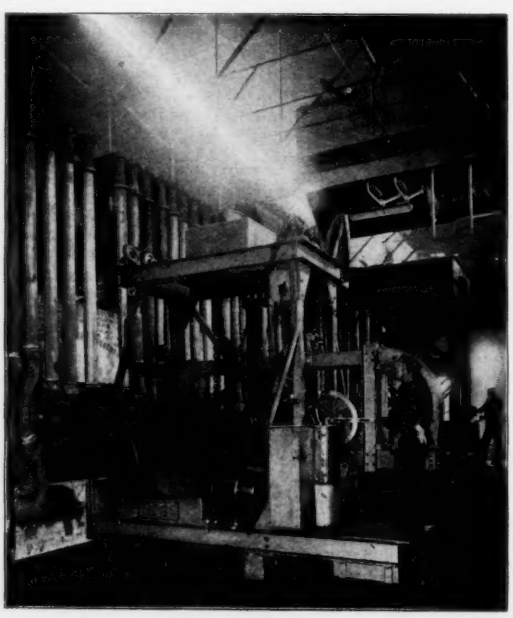
The writer is aware that the different points raised in this article are for the most part elementary and well-known; but they are brought forward in the hope that they may assist in inducing others to ascertain and publish the best methods of manufacturing a gas which is yearly increasing both in popularity and in importance.

THE NEW RETORT-HOUSE OF THE METROPOLITAN GAS COMPANY OF MELBOURNE.

Visit of the Victorian Gas Association to the West Melbourne Gas-Works.

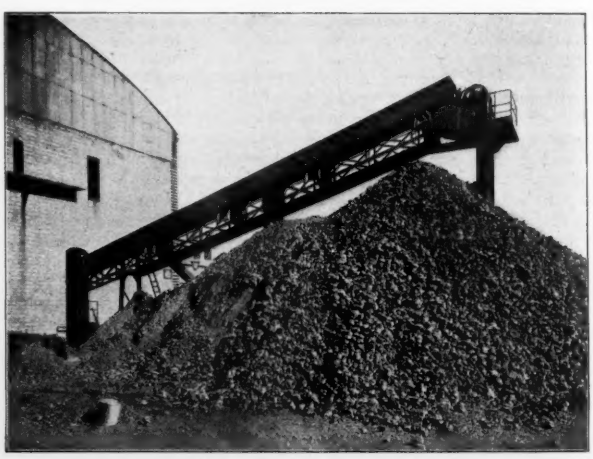
View in the Retort-House—Discharging Side.

AFTER the business had concluded at the recent meeting of the Victorian Gas Association, as reported in last week's "JOURNAL," the members paid a visit to the West Melbourne works of the Metropolitan Gas Company. At the entrance to the works, they were met by the Company's Engineer (Mr. P. C. Holmes Hunt) and the Works Superintendent (Mr. J. W. Thompson). The chief object of the visit was to see the reconstructed retort-house which was completed a few months ago and put into action in October last. The house comprises sixteen beds of eight retorts each, set in two sections; the retorts being horizontals, 21 inches by 15 inches by 20 feet long.

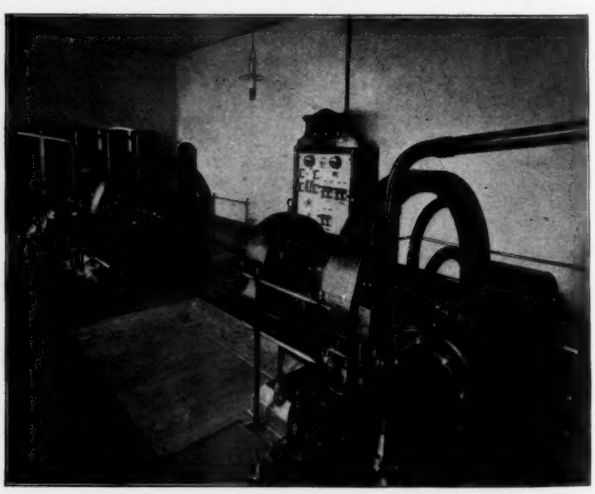


The De Brouwer Pusher-Charger.

The reconstruction entailed the rebuilding of the whole of the work inside the house—including additional foundations and the stage floor; and the house has now a daily capacity of 1,600,000 cubic feet. At the time of the visit, one section of it only was at work; the second section was intended to be put into action in the course of a few weeks. The retort-house has been entirely



Inclined Portion of the Coke Conveyor—Outside the Retort-House.



Electric Power House.

equipped with new machinery of the "De Brouwer" type (manufactured by Messrs. W. J. Jenkins and Co.), and a hot-coke conveyor, also of the "De Brouwer" type, installed for automatically removing the coke. The charging-machine and the pusher run on the stage floor on the coal-store side of the house—as shown in the photograph—the charger being supplied with coal from overhead hoppers placed conveniently apart, so that the machine can carry enough coal to charge all the retorts between the two main hoppers. It will be noticed that the "De Brouwer" charger is of the self-contained hopper type; this being considered preferable to any other, owing to the local conditions to which it had to be suited. The coke-conveyor is 263 feet long, of which 60 feet (outside the house) is inclined at an angle of 15°. The inclined portion is arranged to deposit the coke in various positions on the ground beneath.

All the machinery, with the exception of the coal crushers and elevators, is driven by electricity; the power being supplied by a 32 K.W. dynamo driven direct by a 45 H.P. "National" gas-engine (all in duplicate), placed in a room conveniently situated at the east end of the house. In the room is fitted a switchboard controlling the supply to the trolley wires supplying the stoking-machines, also to a 14 H.P. motor which drives the coke-conveyor. The whole of the plant was supplied by Messrs. Jenkins and Co., and was erected and put to work on arrival in Melbourne by the Gas Company's own staff and workmen.

At the time of the visit, everything was working very satisfactorily; the charges being of eight hours duration (averaging 8 cwt. each) and well burnt off. The total cost of the reconstruction was £19,000.

After the inspection, the members were entertained at tea by the Company; and a hearty vote of thanks was passed to them and to Mr. Hunt for showing them round and explaining things to the members.

WORKMEN'S COMPENSATION CASES.

Cases for compensation to workmen for injuries received by them in the course of their employment are now so many and so important that the collection of them into annual volumes has proved to be of great utility, not only to the professional lawyer but to the layman as well. No apology is needed for referring to such volumes in the "Journal;" for questions relating to workmen's compensation have necessarily to be carefully considered by all concerned in gas-works' management and construction.

Vol. IX. of the series has just been published,* and relates to the more important decisions of the Courts between September, 1906, and August, 1907. It is the last volume prepared by the late Mr. Minton-Senhouse, whose name was originally associated with this series of cases. Their publication, however, will be continued under the learned editorship of his Honour Judge Ruegg, K.C., and Mr. F. J. Coltman, Barrister-at-Law. It is also the last volume dealing with the law as existing before the momentous Act of 1906, which came into force on July 1 of last year. It is likely, therefore, that the succeeding volume will be of more than usual interest.

The present volume, however, is by no means lacking in that respect; and particularly so, perhaps, for readers of the "Journal," whose attention has quite recently been directly drawn to the subject by the admirable paper by Mr. Thomas Berridge, which was presented to the Southern District Association of Gas Engineers and Managers on March 12 last, and was given in our issue of March 17, p. 697. As the author rightly said, the Workmen's Compensation Act, 1897, is now practically repealed; and yet for the interpretation of the new Act of 1906, the decisions under the former Act will be of binding authority wherever they can be applied. Equally, of course, the workmen's former remedies—whether under the Common Law, Lord Campbell's Act, 1846, or the Employers' Liability Act, 1881—remain untouched. At Common Law, the master is still bound to provide competent fellow-servants, safe and efficient machinery, and not to be guilty of personal negligence. The view of the law always has been that there is a responsibility cast upon the master in the selection of his servants; so that if he knowingly engages bad servants, he must take the consequences. This same principle explains some of the superficially apparent inconsistencies or hardships of the Act of 1906. Until the Employers' Liability Act, 1881, the workman, if injured, was in a worse plight legally than an utter stranger would have been; for the employer could set up against the workman, but not against the stranger, the defence known as "common employment," which means that the workman must have been presumed to take all risks accruing from his occupation. The Act of 1881 was very properly designed to upset this defence. Then came the Workmen's Compensation Act, 1897, since largely extended by the Acts of 1900 and 1906, which counteracted the defences that the workman voluntarily took the risk causing the accident, or that it was an inevitable accident, or that he was contributorily negligent. But if the workman was guilty of "serious and wilful misconduct," the employer was not liable. The Act of 1906 now amends this in some respects, and, generally, enlarges the scope of the former Acts.

In the volume under notice, there is a House of Lords' decision on what is "serious and wilful misconduct" (*Bist v. London and South-Western Railway Company*). It was held (although with considerable doubt and great regret expressed by Lord James of Hereford) that an engine-driver who knowingly, though mistakenly, in his employers' interests, violated the rule that "engine-men and firemen must not leave the footplate of their engine when the latter is in motion," was guilty of serious and wilful misconduct, and the refusal of compensation was justified. It is no answer for a workman to say that he believed the course he was adopting, in breach of a rule, was not a dangerous one (*Brooker v. Warren*); and drunkenness, where it occasions the injury, may be "serious and wilful misconduct" (*Bradley v. Salt Union*).

As to the point mentioned by Mr. Berridge in his paper (previously referred to), as to the obligation of a contractor in a gas-works, for instance, to indemnify the gas company in case of an injured workman of the contractor bringing an action against the company, there is a decision of the Court of Appeal in *The Pacific Steam Navigation Company v. Pugh and Son*. The latter were the Contractors for coaling ships belonging to the plaintiff Company. While doing the work, one of the Contractors' men caught his foot in a rail on the quay, and a coal-waggon ran over his foot. The Shipping Company had been held liable to pay compensation as occupiers of the quay; but the Court of Appeal now held that the Contractors were liable to indemnify the Shipping Company, and (apparently) to pay the reasonable costs incurred in resisting the claim. We may, however, add the observation that, in contracts between gas companies and contractors, it will be well to insert a clause making it clear that the latter shall indemnify the former in the event of accidents due to the contractors and their work.

The only other case reported in this volume that we need mention is that of *Rimmer v. The Premier Gas-Engine Company, Limited*. It turned on the oft-discussed phrase "on, in, or about an engineering work." The defendant Company were putting up gas-engines in a building within the general area of a dock and shipbuilding yard. The engines were to be used for generating electric light and power. The power was to be used for opening dock gates; but the gas-engine room was 150 yards away. A workman was ordered by the foreman to help to turn round backwards a 15-ton fly-wheel of one of the engines by standing on a spoke of the wheel. As it turned backwards, his right hand was caught between the cogs of the fly-wheel and of the pinion wheel. Did the accident occur "on, in, or about an engineering work?" The ordinary layman, we take it, would at once answer "Yes." But the Court of Appeal (Lord Justice Kennedy dissenting), following the House of Lords' decision in *Back v. Dick Kerr and Co.* (1906, A.C. 325), held that the workman was not engaged in an "engineering work" within section 7 of the Act of 1897—his work being in no direct sense a part of the construction of a dock. The view of the Master of the Rolls was that "the accident did not take place in the 'dock' in any proper sense of that word at all. It happened in a place about 150 yards from the nearest part of any one of the docks." Lord Justice Kennedy's dissenting view was that "the workman was engaged constructing something which was necessary for the dock and which was intended to be in permanent connection with the dock." Shall the House of Lords decide?

* "Workmen's Compensation Cases, Vol. IX.; being Reports of Cases decided under the Workmen's Compensation Acts during the Period September, 1906, to August, 1907." Edited by the late R. M. Minton-Senhouse, Esq., of the Inner Temple and Oxford Circuit, Barrister-at-Law, and his Honour Judge Ruegg, K.C., and F. J. Coltman, Esq., of the Inner Temple and Midland Circuit, Barrister-at-Law. London: Butterworth and Co.; 1908.

Southern Association of Gas Engineers and Managers.—The spring meeting of the Association has been fixed for Thursday, the 21st prox., when the members will visit the works of the Salisbury Gas Company, at the invitation of the Chairman and Directors, and will be entertained by them to luncheon at the Town Hall. For the afternoon, a drive to Stonehenge has been arranged; tea being taken *en route*.

South-East of Ireland Gas Association.—We learn from the Hon. Secretary and Treasurer (Mr. J. F. Tyndall, of Wicklow) that a quarterly general meeting of the Association will be held at Fermoy next Thursday, under the presidency of Mr. D. W. Tooms, the Manager of the Fermoy Gas-Works. The business will consist of the President's Address, which will be open for discussion, and a paper on "Suction Gas-Producer Plants," by Mr. J. Carter, of Dublin. A "Telephos" apparatus will be on view on the occasion.

Eastern Counties Gas Managers' Association.—The 39th general meeting of the Association will be held at Felixstowe next Friday, under the presidency of Mr. Joseph Davis, the Engineer and Manager of the Gravesend Gas Company. According to the programme issued by the Hon. Secretary and Treasurer (Mr. T. A. Guyatt), the members will be entertained at luncheon by the Chairman and Directors of the Felixstowe Gas Company, in the Felix Hotel, where the meeting will afterwards be held. The business will consist of the presentation of the report and accounts for the past year, the election of officers for the current year, and the reading of a paper by Mr. F. Paternoster, of Felixstowe, on "Retort-House Working for Small Works." After the meeting, the members will dine together. Should the weather be favourable, an excursion, in which ladies will be invited to take part, will be arranged for Saturday.

POWER-GAS PRODUCERS.*

THIS is a book devoted to the general design and application of suction and producer gas plants; the engine not coming in for discussion. The volume is obviously intended for power users dependent on producer gas for their fuel. But there are phases of the subject which peculiarly interest town gas suppliers; and we propose, on this account, reviewing the book at greater length than we otherwise should. The author, Mr. P. W. Robson, was at one time the Vice-Principal of the Manchester School of Technology, but is now engaged with the National Gas-Engine Company, Limited. The latter fact allows Mr. Robson to speak from practical experience, although it tends to bring into favoured and noticeable prominence the plant of his own firm. We give the author, however, credit for desiring to be fair and impartial; and producer gas users will find his book a useful one.

It will be remembered that in the 1906 Derby trials, described by the author as "the only authoritative comparative tests," the "National" gas-plant obtained the highest award for design and performance. It becomes interesting therefore to see how far Mr. Robson, claiming experience with "many hundreds" of, presumably, "National" gas plants, corroborates or modifies the data of those tests, and the consequent cost of suction gas. The book is divided into three sections, treating successively of the theory and practice of suction-gas producers, pressure plants for non-bituminous fuel, and producers for bituminous coal, with a page or two on coke-oven and blast-furnace gas. It does not perhaps furnish much that is new for those who have followed producer-gas development through the Technical Press; but for others, the volume will provide a clear and handy description of the whole process, and particularly of suction-gas plants. The volume is well illustrated.

With the recent increase in the use of gas power, it must be admitted that producer plants have found a place in all problems of economical power generation. They stand for cheap power as compared with certain competitors; but the author briefly dismisses the latter by disregarding steam and taking the public electric supply as the only rival worthy of a word of dismissal. We cannot but believe that town gas, which is unmentioned, will remain long in the field for ordinary requirements; and the latter would appear to be considerable, since, as estimated, "the power demand of 80 per cent. of British manufacturers is under 300 B.H.P." Mr. Robson anticipates a good future for producer gas. So far as development of the plant is concerned, giving as high an efficiency as 85 to 90 per cent. to the suction and 80 per cent. to the pressure type, he naturally looks rather to the engine as affording the best hope for further improvement.

The author starts with a general description of a suction-gas plant—using the "National" and Tangye for purposes of illustration—and then deals with the necessary theoretical considerations involved in the generation of the gas. The chief fuels used are anthracite, non-caking bituminous coal, and gas-coke; and Mr. Robson evidently regards the latter with great favour in view of its low price compared with anthracite. He says that the growing tendency to use cheap fuel is causing the makers to design plants to this end. The action of both air and steam with the resultant chemical reaction in the evolution of producer gas is well treated, and makes a good readable chapter. The temperature at which the producer is worked has a very important influence on the quality of the gas; and as the author considers the working temperature is entirely controlled by the amount of steam passed through the fire, he properly discusses the regulation of the steam supply from the vaporizer. An excess of steam, while lessening clinker trouble, lowers the temperature, and produces poor gas. It is stated that of the many producer patterns on the market, there are probably not more than two in which the steam is properly controlled; and of course, the "National" is one of the two. The "flash" vaporizer, with its trickling water, would certainly appear to allow of good regulation; but with the fuel consumption varying with the load, and in the absence of an attendant's watchful eye, there would seem to be as great a possibility of inadequate steaming in the case of the flash as with any other form of vaporizer.

The succeeding chapters deal with the design and construction of the generator and of the cooling and purifying plant with their necessary connections. Some little attention is paid to the effect of the grate area and depth of fuel. Since with a low air velocity less carbon dioxide is produced, the trend of practice is now to make the furnace area larger than was once thought necessary. The leading makers work to about 8 square inches per brake-horse-power. The suction-gas producers described are the Crossley, Dowson, Tangye, Campbell, and National; some brief reference being made to the Hornsby-Stockport, the Mersey, and the Dudbridge. The constructional details throughout the book are descriptive rather than otherwise; nothing being dimensioned. No information is given regarding the floor space, building, or even foundations required for the plant, and costs of apparatus and fixing are forgotten. These omissions detract from the value of the book.

The lowest quantity of water required under conditions of full load for cooling the gas in the scrubber is given as 1¼ gallons per brake-horse-power. On a basis of about 65 cubic feet of gas per brake-horse-power, it is theoretically shown that 1·02 gallons are required. Calculating, however, from tables given later in the book, the gas basis should be at least 50 per cent. higher; and the water consumption is therefore over 1½ gallons. Add the ¼ gallon used in the vaporizer, we get nearly 2 gallons of water theoretically required per brake-horse-power; increasing both the cost and the trouble of effluent disposal. The latter question is one apparently which has at times to be seriously faced.

The author devotes a chapter to suction plants for bituminous fuels. His conclusion is, briefly, that in this country when gas coke can be obtained for less than 15s. a ton it is unprofitable to use bituminous fuel for ordinary plants, in view of the more costly apparatus and increased attention required. The next chapter gives useful instructions for actual working; but these are much like those issued by the various makers. The attention required is stated to be not more than half-a-man's time over the working week; but it is evident, from the author's own showing, the rest of the time cannot very well be employed economically elsewhere, since the attention is required throughout the day, although intermittently.

In discussing working results, the author usefully reprints, and comments upon, the tabulated data of the Derby trials. No attempt is made to give the reader particulars of costs; but sufficient is probably furnished to warrant estimates. The author's only approach to a comparison of working cost is on page 122, when he simply refers to the Sheffield Gas Company's price of 1s. per 1000 cubic feet as an example of town gas making producer gas a questionable undertaking for power units under 100 B.H.P. With this we should agree, even were the price double that quoted. Useful light, however, is thrown on fuel consumption matters. Mr. Robson candidly states that the Derby results were under conditions representing the very best that the various plants were capable of achieving, and, in spite of the makers' claim, based on those tests of 1 lb. of anthracite per brake-horse-power as the fuel requirement, he gives 1½ lbs. as the all-round consumption for average loads, and including stand-by and other losses. From this and similar data supplied by the author, it is not so difficult to calculate approximate working costs. Take (say) the case of a 50 H.P. plant working with an average load of 30 B.H.P. for some 50 weeks of 54 hours, and we get the following figures:—

	Per B.H.P.
1½ lbs. anthracite peas or beans, at 30s. delivered . .	= 0·241d.
1¾ gallons water (see above), at 1s.	0·021
Labour, based only on three days a week at 5s. . . .	0·111
Repairs, renewals, and stores—say, £10 per annum .	0·029
Working costs per brake-horse-power . . .	0·402d.

This cost per brake-horse-power is equivalent to that of town gas at about 1s. 10½d. per 1000 cubic feet; and when interest and other costs of capital for plant, housing, and site are added, it becomes very difficult to understand why any power user should overlook town gas, where obtainable, for the problematical advantages and undoubted worries of a suction-gas plant.

It is, perhaps, unnecessary to follow the author so closely through the remaining and briefer sections of the book which deal with pressure plants for non-bituminous and bituminous fuel. As Mr. Robson remarks, these have largely been superseded by the suction variety, and are now mainly of consequence where gas is required for heating as well as power. They are, apart from capital costs, recognized as being less efficient than the suction plant, since there is not so great a recovery of waste heat in the producer, and additional fuel is required for firing the independent boiler. Although Mr. Dowson considers that gas of higher calorific value can be made with his pressure compared with suction plants, the author maintains that with ordinary care quite as good a quality can be realized in suction gas. Various pressure plants are described, and particulars given as to theory and working. The Dellwik-Fleischer and Mond processes are included, and briefly dealt with. Here again, dealing with pressure plants, the author fails to give information as to the installation of plant; and both capital and working costs are overlooked.

As a descriptive book in the matter of apparatus, theory, and practice, it will be serviceable to any who wish to acquire a knowledge of power-gas producers.

* "Power Gas Producers: Their Design and Application." By Philip W. Robson, formerly Vice-Principal of the Municipal School of Technology, Manchester. London: Edward Arnold; 1908 [10s. 6d. net].

Last Thursday, the elder daughter (Rhoda) of Mr. Charles Hunt, M.Inst.C.E., of Kelvin Grove, Beckenham, was married at the Parish Church, Beckenham, to William Harry, the eldest son of the late Mr. W. H. Ferguson, of Hollington Park, St. Leonards, and of Mrs. Ferguson, of Storth Holme, Beckenham.

Mr. Robert Laidlaw, J.P., of Balmory, Bute, of the Alliance Foundry and the Broomhill Foundry, Glasgow, and of Simon Square, Edinburgh, Chairman of the Anglo-Portuguese Gas and Water Company, Limited, Deputy-Chairman of the Tuscan Gas Company, Limited, and a Director of the Anglo-Spanish Gas Company, Limited, whose death was recorded in the "JOURNAL" for Oct. 29 last, left, exclusive of real estate, personal estate in the United Kingdom valued at £18,473.

The German Consul at Breslau reports a very active demand throughout Germany for sulphate of ammonia. It is possible that in the spring the demand will be greater than the supply, as the article is already scarce, owing chiefly to the irregular and restricted output of the coke-ovens. Another point is that the agricultural industry is taking an increasing interest in the product. It is estimated that an output of 300,000 tons, of the value of £3,750,000, could be dealt with in Germany without difficulty.

NEW GAS-WORKS AT ARNSIDE.

By Thomas Redman.

(Part III.)

Having pretty well exhausted this narrative within the boundary of the works, wherein production, purification, and storage are carried out, we must now follow the sequence of its mission—viz., distribution.

High-Pressure Distribution.—Some three miles of gas-mains are laid. These have been tested, not only in section, but as a whole, from the works, at a pressure of 40 lbs. to the square inch, and found to stand for days without reduction or loss. The mains are of wrought iron throughout—not a single length or foot of cast iron is intended in the whole system. The pipes are all guaranteed to withstand a pressure of 300 lbs.; and the various individual testings have proved thus far quite satisfactory. It is at first intended to start the distribution with as many pounds per square inch as the ordinary low-pressure system which cast-iron mains would require in inches by column of water; but just how far we shall succeed with this proposition is yet to be proved, for the governors or pressure-reducers intended for the work are all, with the exception of the station governor, of American make, and primarily intended to work at a much higher initial pressure. Therefore, it may eventually be necessary to increase the initial pressure to secure their proper working. Should it, however, be found that the governors will work satisfactorily at the former pressure, equal in pounds to inches, then the mains, small as they look in capacity, are laid with an intention of covering the requirements for a period of some fifteen to twenty years, with a normal growth of the place; and this, to some extent, covers the anticipated extra requirements in gas for the various branches of fuel in future. This is so, notwithstanding that the trunk main leaving the works, and for a long length leading into the village, is but of 1½-inch bore, which substitutes that of a 6-inch cast-iron pipe, and will, easy working, exceed in the delivery under the different conditions of a much larger volume, when required, than cast-iron mains at low pressure, and that without the additional expense and risk of fracture by the steam road-rollers or casual heavy traffic on the varying subsoil over which the roads are made. This, in many places, is on solid rock to the very surface, and protruding, and in others upon sea silt and silt over bog or beds of peat, making them as elastic and springy in these positions as they well can be, as against the solid limestone rock at other points in frequent close quarters.

These local conditions and the considerable saving in excavating required between the two systems of cast-iron and wrought-iron pipe, together with the proper and reasonable requirements of the local authorities—viz., 2 ft. 6 in. deep to the top of cast-iron mains, as against 1 foot to 1 ft. 3 in. for wrought-iron mains—and when it is seen that solid rock exists to a very large extent, the saving effected may easily be seen. There is another important advantage arising through this system of shallow cover, affecting a point that was raised by the members of the Council at one of the meetings held for the purpose of arranging terms and conditions—*i.e.*, the danger and liability of any escaping gas from fractured mains entering the drains, and thence passing to the dwellings. By the shallow cover, escaping gas is, without doubt, infinitely more likely to find a ready escape to, and by way of, the surface than from a depth of double and more of cover; hence its less liability to enter drains and percolate through the earth, or under and through the walls into the residences. The shallow cover also lends itself greatly to the more speedy detection of escapes, if any ever occur. The foregoing, and the knowledge that gas storage under compression was likely to be adopted, formed the factors in the adoption of wrought-iron high-pressure mains for distribution work. The pressure of the accumulated gas in the high-pressure receivers may be anything from the pressure in the distributing mains—at which point it would be equivalent to the ordinary storage holder grounding—up to 10 atmospheres. This long range of pressure is reduced and controlled to a constant main pressure by a Bailey's special reducing valve, Foster's patent. The gas is then further reduced in pressure for the consumers from pounds to inches, which takes place largely by the grouping and fixing of suitable sized governors to the requirements.

A Great Advantage Offered to Consumers.—The high-pressure system of distribution forms a magnificent basis for offering and securing to the consumers the best and most economical means of using gas for all purposes, lighting or otherwise; for any desired pressure may be established with these governors. Thus all the undoubted advantages of high-pressure incandescent lighting may be had in large or small units without the initial expense and trouble attendant on putting down a separate compressing plant. What would such a general system and offer mean to the gas industry were it available in any large industrial centre where the competition with electricity is keen? The advantages of this answer could possibly meet all the cases. I am, however, a firm I leave to readers in their varied circumstances; for no single believer in the high-pressure distribution system, with all its attendant advantages, and opine that, before many years hence, the gas industry will undergo some great changes in this respect, with considerable advantages to owners.

High-Pressure Storage in lieu of Gasholders.—The chief reason for the adoption of this instead of the ordinary method of storage was on account of the treacherous nature of the subsoil on the only reasonably available site offered. This consists of a very slippery silt of varying thickness, over thick deposits of fibrous peat in some portions and percolating substreams in others, and bordered on its entire length by a "shut-off" tidal stream. A very striking illustration of the utility of this method of storage, with its connections of small flexible wrought-iron tubes, took place during the great storm and tidal flood of March 17, 1907. The land is redeemed from the shore and bordered some distance away by the embankment of the Furness Railway branch line to Kendal. This storm, however, washed away the embankment in several places, which let in the extraordinary high tidal waters. This, in turn, flooded the gas-works premises, bursting in the walls surrounding the stack of five high-pressure receivers ○○○○○, which eventually began to float at the lighter ends, and apparently would have done so bodily and distributed themselves, but for the fact that at the valve and feeding ends that side of the brick pressure house stands upon them. The structure was badly cracked, put out of shape, and almost wrecked by the action of the light outer ends floating and swaying about in the storm. But, strange to say, not a single joint or connection was broken, or even damaged to a leaky state—a very satisfactory result, and one which proves up to the hilt a recent statement by a writer from San Francisco, who said "that it took no less a shock than an earthquake to demonstrate the full value of wrought-iron or steel mains." At the San Francisco earthquake, it is reported that not a single main was broken—truly a most remarkable result, which very probably saved many serious conflagrations and further lives. Here, then, are the reasons—subsoil, together with the advantages in distribution—for the adoption of high-pressure storage, with the satisfactory proofs as above related; and the many and repeated proofs from all directions tends to show it was a wise selection.

Let us now retrace our steps to the works. In connection with the manager's house and office is a large show-room for the display of all kinds of fittings, burners, lamps, fires, cookers, stoves, grillers, and the indispensable boiling ring, &c., and in which any of them may be readily connected and put into actual operation at any time for intending customers to see; while displays of lighting on various systems will be given from time to time. These are the duties imposed on all gas suppliers who do not desire to be in the rear ranks or left in the cold.

The whole of the programme of this small venture, consisting as it does of an almost entire change from beginning to end in designs and methods, was truly a large order. But there were objects in view; and these objects were fully discussed by the directors and leading members of the Company at its formation, and from whom the directorate, including myself, were elected. However, concurrent with the formation of the Company, there was formed a Syndicate, who elected to be known as the "Redman Gas-Plant Syndicate," whose object was to assist, on conditions granted by the patentee, in developing and exploiting several patents, which patents were adopted by resolution of the Directors of the Gas Company for their works. At that date, the directorate consisted, with the exception of one, of members of the Syndicate, including the Secretary, who, it should be mentioned, was Secretary to both bodies—the Gas Company and the Syndicate. Herein, then, lies the reason for the adoption of such a large order and changed programme to the ordinary established every-day lines within the works proper. Nevertheless, is it not perfectly true that all the greatest discoveries have been made by leaving the beaten tracks and going into bye-paths or the unbeaten tracks?

Coal Contracts for the Present Year.

It will doubtless be remembered that, in view of the introduction of the Government Coal Mines Bill, a decision was come to by colliery owners to insert the following clause in all new house and gas coal contracts: "In the event of there being any legislative restriction of the working hours underground in mines, the price fixed under this contract shall only continue until such time as the Act limiting the working hours comes into operation, after which date it shall be increased by 1s. 6d. per ton during the remainder of the contract period." It appears, however, from an article in the "Iron and Coal Trades Review," that the statement made by Mr. Gladstone, to the effect that the Bill, if passed, would not become operative until after June 30, 1909, which was noticed in the "Journal" last week (p. 155), will render unnecessary the insertion of the clause in contracts made this year which do not extend beyond that date. The colliery owners have therefore decided to allow the clause to remain in abeyance for the present. They have, however, confirmed the resolution they previously passed, to the effect that the 2s. 6d. advance upon 1906 prices should be adhered to, in view of the increased rate of miners' wages paid now as compared with that obtaining at the time contracts were made last year.

The Secret Commissions and Bribery Prevention League has now received its certificate of incorporation, and a public meeting in furtherance of its objects will shortly be held in London. The League, of which Sir Edward Fry is President, has now upwards of 200 members.

GLOVER AND WEST'S APPARATUS FOR CHARGING VERTICAL RETORTS.

The interest at present attaching to coal carbonization in vertical retorts warrants special prominence being given in these columns to a patent specification issued last week in the names of Mr. Samuel Glover, of St. Helens, and Mr. John West, of Manchester and Southport.

The patentees say: The invention has reference to, and comprises, apparatus for feeding coal to vertical retorts used in the process of destructive distillation, and has for its object "to feed the material into the retorts in a regular and constant manner, and to facilitate the withdrawal of the gaseous products through any desired depth of the material which is being fed into the retorts—such depth being constant notwithstanding variations in the amount of coal in the hopper."

In order to accomplish these objects, a rectangular or square chamber is constructed, and connected to the underside of an overhead bunker or hopper by means of one or more gas-tight valves. This chamber is constructed of two parts—the lower part taking the form of conical outlets (one for each retort); while the top may have a rigid attachment to the lower part, or be made to telescope into the lower part. To each conical outlet is attached a tapered tubular shoot, which leads direct into the retort; and the space in the retort above the level of the charge may be varied as required by raising or lowering the bottom section of the chamber when it is adjustable. The telescopic connection between the two parts would allow this to be done more readily, or the tapered tubular shoot may be connected to the retort, in which latter case the retort will be completely filled with coal.

The tubular shoots are connected to the conical outlets from the chamber in a manner which permits sufficient space being left for the gaseous products to pass through, and thence into the material in the chamber above.

A number of vertically adjustable pipes are suspended within the chamber; and, under normal working conditions, these pipes have the lower part of their lengths immersed in the material contained in the chamber. The gaseous products pass first through the material, then through the pipes, and so into the space in the upper part of the chamber. The object of using these pipes is "to facilitate the maintenance of a constant and even pressure within the retorts." The pipes may either be perforated or plain, or partly perforated and partly plain.

At stated times, the chamber is charged with material from the overhead bunker; and as the residual products are discharged from the lower ends of the retorts, the charge contained in the chamber flows into the retort at the same rate as the discharge takes place, and so maintains a constant level of material in the retorts.

Fig. 1 is a sectional elevation through the charging apparatus, and shows the chamber constructed in two parts—one part telescoping into the other—and with tapered tubular shoots which project into the retorts. Fig. 2 shows the chamber constructed

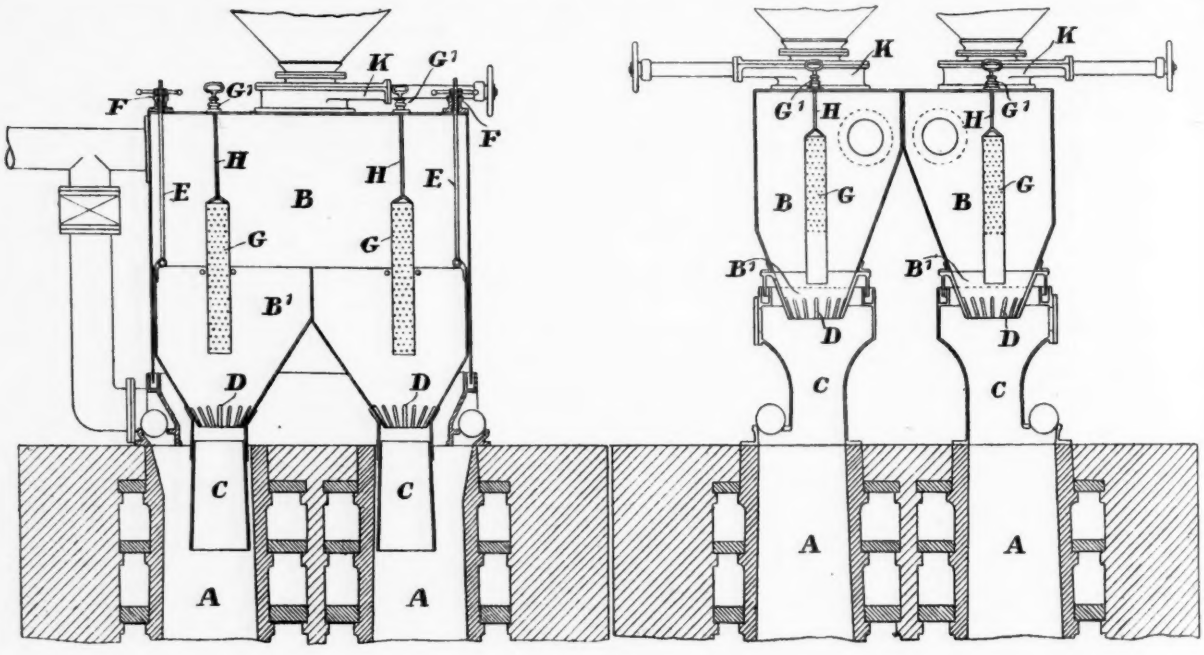


FIG. 1. FIG. 2.

Glover and West's Vertical-Retort Charging Apparatus.

without the telescopic contrivance, and is an alternative arrangement in which the tapered shoots do not project into the retorts, but are connected up to them.

A are the vertical retorts; B, the upper part of the chamber; and B^1, the lower part which is made to telescope into B. When arranged as in fig. 1, the tapered tubular shoots C are fixed to the lower ends or outlets of B; and slots D are formed at the lower ends of B^1, "so as to present a large surface of coal to the gaseous products of distillation."

In the arrangement shown in fig. 1, the distance to which the shoots are in the retorts is adjusted by raising or lowering the telescopic part of the chamber B^1 by means of the rods E, which pass through the gas-tight stuffing-boxes F.

The pipes G are for conveying the gas from the body of the coal contained in the chamber B^1 to the free space in the upper part of the chamber B—the object being "to ensure the gases passing through a constant depth or body of coal, and to this extent facilitate the maintenance of an even pressure within the retorts, the depth depending to some extent on the nature of the coal itself."

The pipes G may be of any desired number; and the depth to which they enter the coal may be varied by means of the rods H, which pass through the stuffing-boxes G^1.

At stated intervals, the coal is fed through the gas-tight valves K into the chamber B. It then passes into the retorts through the shoots C; the rate of feeding being dependent upon the rate of discharge at the lower ends of the retorts. The gaseous products of distillation pass through the slots D into the coal; thence through the pipes G into the space above the coal; and thence to the condensing plant.

In fig. 2, the two parts of the chamber B and B^1 have a rigid attachment, and the tapered tubular shoots C do not enter the retort. This arrangement enables the retorts to be completely filled. The gaseous products of distillation pass through the lower portion of the coal, and through the pipes G into the space above —as in fig. 1.

The patentees claim: (1) In a retort the means for maintaining constant the depth of material through which the gaseous products of distillation pass, consisting of the charging hopper having a tubular shoot that enters more or less into the retort, gaseous inlets from the retort into the hopper, and an open-topped pipe descending into the material in the hopper. (2) The application of a plain or perforated open-topped tube or tubes with vertical adjustment for decreasing or increasing the depth of the coal through which the gaseous products of distillation pass. (3) The provision of a tapered tubular shoot, which has a vertical adjustment and enters the retort for the purpose of regulating the depth of coal in the retort. (4) In apparatus as claimed in Claim 2 for charging vertical retorts, in which the depth of coal through which the gaseous products of distillation pass is kept constant, the provision of a fixed tapered tubular shoot for supplying the coal from the feeding chamber to the retort when it is desired to completely fill the retort. (5) The retort for distillation of coal provided with means for maintaining a constant depth of fuel through which the gaseous products of distillation pass.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting at Newcastle-on-Tyne.

The Sixty-Second Half-Yearly General Meeting of the Association was held in the Lecture Theatre of the North of England Institute of Mining and Mechanical Engineers, Newcastle, last Saturday—Mr. H. WILKINSON, of Harrogate (the President), in the chair. There was a good attendance of members.

The PRESIDENT, in opening the proceedings, said he was sorry the members were meeting under conditions which, so far as the North of England area was concerned, were of a very depressing character. There was on the north-east coast an existing strike; and the newspapers that morning held out a gloomy prospect with regard to the future. This, he was afraid, would operate prejudicially to the interests of the industry they represented. Then they had, in their face, a Bill, which would probably become law, for curtailing the working hours of the miners; and it was anticipated that this would have a very serious effect upon the gas industry. It was a question whether they ought not to submit to the meeting a resolution upon the subject; but as they were affiliated with the Institution of Gas Engineers, and the Institution were taking active measures in regard to the Bill, it was thought that they might dispense with a formal resolution. The next matter to which he would refer was the death of Mr. W. J. Warner, who, as the members would know, was their first President. His close connection with the Association made it very appropriate that they should, at any rate, make reference to it on this occasion—the first meeting after his death. It was not necessary to submit a vote of condolence with the family, because the Committee anticipated what the members' views and wishes would be; and shortly after Mr. Warner's death a suitable letter was sent. They had also to regret the death of three of their Associates—Mr. H. F. Burrows, Mr. Robert Laidlaw, and Mr. R. Shotton. They regretted very much to find that an old friend of theirs—Mr. J. H. Cox—was absent through illness. They trusted that he might soon be convalescent, and be able to return, and that they might have the pleasure of his presence on many future occasions. During the year they had had four new members and five associates elected; and there were at present two proposals for membership, and three for associate membership. Against this they had had two resignations; and he was sorry that a few names had had to be written off, in consequence of members being in arrears with their subscriptions. He offered to the new members and associates a hearty welcome; also to the President of the Institution of Gas Engineers; to Mr. F. Gibson, from Valparaiso (who, he understood, was present), and to Mr. Moon, who was leaving England to take up a responsible position in Vancouver. They would notice that the place of the Vice-President was occupied by the President of the Institution of Gas Engineers. This was necessary because Mr. Hovey, who was Vice-President, had obtained, as they were aware, an important appointment in Milan. It was the pleasure of the Committee, on the 10th of February, to give Mr. Hovey a complimentary dinner; and it was gratifying to see a fair number of members at the gathering. They had a letter from Mr. Hovey, which the Hon. Secretary would be good enough to read. A vote of thanks to Mr. Hovey seemed appropriate, and it would be submitted in due course. There was one other matter to which he would refer—viz., the Workmen's Compensation Act. Twelve months ago, Mr. Bower introduced the question of the Act, and the effect which was likely to be produced, owing to the high rate of tariff which the Insurance Companies were charging. The Committee took up the matter energetically. They had several meetings, following in quick succession, and did their best in regard to the matter. The conclusions they arrived at were submitted to them; and they had the satisfaction of believing that the reduced rates which were ultimately quoted by the tariff houses were due, in great measure, to the steps taken by the Association.

The HON. SECRETARY (Mr. H. Lees, of Hexham) read the letter from Mr. Hovey, sent from Milan on the 17th inst., in which he expressed regret at his inability to be present at the meeting; also letters to the same effect from Mr. Cox, of Sunderland, Mr. Matthew Leaf, of York, and several of the Presidents of Gas Associations in England. Mr. Lees also submitted the statement of accounts, which showed that the receipts amounted to £187, and that there was a balance of £86 carried forward.

NEW MEMBERS AND ASSOCIATES.

The following were admitted to the Association:—

Members.—Mr. W. M'Intosh Valon, Assistant-Manager, South Shields Gas-Works; and Mr. F. C. Willis, Assistant-Manager, North Shields Gas-Works.

Associates.—Mr. R. W. Ford, of Stockton-on-Tees; Mr. V. Porteous, of Hexham; and Mr. A. C. Wilson, of Stockton.

Mr. J. H. Hill, the Secretary and Manager to the York Gas Company, was transferred from the position of associate to that of member.

NEXT PLACE OF MEETING.

Mr. W. FORD extended a hearty welcome to the Association to visit Stockton on the occasion of their October meeting. He was sure that his esteemed Chairman and the Mayor would re-echo his sentiments in their reception of the Association.

The invitation was cordially accepted.

ELECTION OF OFFICERS.

The Scrutineers reported that the election of officers had resulted as follows:—

President.—Mr. W. Ford, of Stockton-on-Tees.
Vice-President.—Mr. T. H. Duxbury, of South Shields.
Auditor.—Mr. C. H. Armstrong, of Wallsend-on-Tyne.
Hon. Secretary and Treasurer.—Mr. H. Lees, of Hexham.
Members of Committee.—Mr. A. Allan, of Scarborough; and Mr. J. C. Angus, of York.

REPRESENTATIVE ON THE COUNCIL OF THE INSTITUTION.

The PRESIDENT said that at the last meeting of the Committee they had under consideration the question of who should represent the Association on the Council of the Institution of Gas Engineers. They were good enough to invite him to do so; but he did not feel that his duties would permit him to give the matter the attention which the position deserved, and Mr. Herbert Lees was unanimously elected as their representative.

VOTES OF THANKS.

After the reading and discussion of three papers, which appear elsewhere to-day,

Mr. W. HARDIE (North Shields) proposed a vote of thanks to the Committee, the authors of papers, the Scrutineers, and the President and Council of the North of England Institute of Mining and Mechanical Engineers. Their thanks were very much due to the Committee for the work they had done during the past session. This was the first time the Committee had thought fit to call them together half-an-hour earlier than usual, so that they might have sufficient time to discuss the papers. This was necessary on the present occasion. They had had excellent papers; and they owed the authors of them a vote of thanks. Their thanks also were specially due to the Council of the Institute of Mining Engineers for giving them the use of the meeting place.

Mr. W. FORD (Stockton) seconded, and at the same time expressed his thanks to the members of the Association for their kind reception of him as President for the coming year. He hoped that, with his long number of years behind him, he might not disappoint them. He felt very awkwardly when he heard the letter read from their friend now far away; and it was with diffidence that he accepted the high honour they had conferred upon him in re-electing him. It was 28 years since he occupied the presidential chair; and they could well imagine that, having been in business all this time, he perhaps might not have the recollection and other qualities necessary to fill the position of President of the Association. He hoped, therefore, that he would have the assistance of their friend the Hon. Secretary, and of the Committee, and also the forbearance of the members; and he trusted that they would not be disappointed in him.

The PRESIDENT proposed a vote of thanks to the Vice-President, who had been obliged to leave them in consequence of his having received an appointment abroad. The Vice-President had thoroughly at heart the interests of the Association; and he (the President) was sure that, though so many miles separated them, his thoughts were with them that day, and that he would continue a member of the Association. He hoped that at some future time they would be able to welcome him once more among them.

Mr. F. P. TARRATT (Darlington) seconded; and both votes were unanimously agreed to.

Mr. W. DOIG GIBB (Newcastle) proposed, and Mr. G. KEYTE (Workington) seconded, a vote of thanks to the President for his conduct in the chair during the year.

The PRESIDENT briefly acknowledged the compliment; and the proceedings were brought to a close, after a sitting of three hours.

The members afterwards dined together in the Royal Turk's Head Hotel. Mr. Wilkinson occupied the chair. The toast of "The North of England Gas Managers' Association" was proposed by Mr. J. H. Hill, of York, as President of the Yorkshire Junior Gas Association, and was responded to by the President. Mr. T. Bower proposed the toast of "Kindred Associations;" and Mr. W. Doig Gibb responded.

Tarring of Road Surfaces.—With the approach of summer and the increasing popularity of the motor-car, the dust problem is again confronting the various authorities responsible for the maintenance of the roads. We learn from the "Local Government Journal" that in Kent the main roads are to be painted with tar; and it is expected that before Whitsuntide the road from London to Folkestone will have been treated. The Bucks County Council are going to lay "tarmac" on a section of the Bath road; last summer's work having been satisfactory. There are now upwards of 300 miles of tarred paths in the county of Essex, and more work of this character is being arranged for. The Beds County Surveyor reports that his experience of tar-painting road surfaces is that it is an effective preventive of dust in the summer season, but is liable to "churn" during the winter. More painting is, however, to be done.

HIGH TEMPERATURE CARBONIZATION.

By Alexander Allan, F.C.I.S., of Scarborough.

[A Paper Read at the Meeting of the North of England Gas Managers' Association, Saturday, April 25.]

From 1802, when Murdoch first used his horizontal retort, until about 1816, cast-iron retorts were exclusively employed to carbonize coal. It is interesting to note that during this time inclined, vertical, and rotary retorts were all tried; but apparently without any satisfactory results, as only the horizontal survived. Between 1816 and 1820, clay retorts were manufactured for the first time, and were employed at several gas-works in Scotland. So satisfactory were the results obtained, that cast-iron retorts, which had well served their day and generation, and from which a make of gas was produced of about 7000 to 9000 cubic feet per ton, were from that time gradually discarded.

After the introduction of clay retorts, a higher temperature could be employed; and the make of gas per ton of coal was therefore increased from between 7000 and 9000 cubic feet per ton of coal to about 10,000 cubic feet. This system of carbonizing by direct-fired horizontal clay retorts was in general use in this country until the early eighties, when gaseous firing was introduced. This was certainly a step in the right direction, as not only was the make of gas per ton much increased, but a large saving was effected in the amount of fuel used and in wages for firing. A few years afterwards, in 1885, M. Coze, of Rheims, brought out his inclined setting, which many gas-works have since introduced, for the destructive distillation of coal, and from which very good results have been obtained not only in yield of gas, but chiefly in the cost of carbonizing, which was reduced to practically half of that by hand labour. With the introduction of gaseous firing applied to retorts, set either as inclines or horizontals, especially when the latter are worked by machinery, the best results in the carbonization of coal have so far been obtained by the gas engineer, not only in the results from the coal, but in the cost of carbonizing, which has been considerably reduced.

In 1890, carburetted water gas was first introduced into this country by Messrs. Humphreys and Glasgow, when four sections were erected at the Beckton Gas-Works; and since that time similar plant has been installed in many works—chiefly with a view of saving heavy expenditure in the erection of coal-gas plant, or in case of emergency to enable sudden demands upon the gas supply to be expeditiously met. On taking charge of my present works, I found that a water-gas plant had been installed about three years previously. Scarborough not being a manufacturing town, or subjected to fogs, no sudden demand for gas was likely to arise. However, knowing the ease with which the production and quality of carburetted water gas could be controlled, I thought a means was at hand whereby the results obtained from the coal-gas plant could be improved. Accordingly, with this object in view, the two plants were worked in continuous conjunction, which arrangement, I think you will presently agree with me, practically fulfils the point brought out by Herr Körting, of Berlin, in his paper, on "The Vertical Retort from a Practical Point of View," read at the meeting of the Institution of Gas Engineers in June, 1906, wherein he stated "that the great problem for gas engineers is to find means of materially increasing the production of gas per ton of coal without too much impairing the quality."

At Scarborough, the coal is carbonized in Klönne settings of horizontal retorts, 22 in. by 16 in. ⌂ section, which are worked at a high heat—bright orange colour; 6½ cwt. charges being carbonized in 4 hours 48 minutes. One had to work carefully to prevent trouble arising through stopped ascension pipes or thick tar in the mains. A strict supervision was also kept in the retort-house to see that the heats were uniform, and for other matters appertaining to the proper working of the retorts. The gas made per ton of coal carbonized has been increased from 11,460 cubic feet in 1901 to 12,497 cubic feet in 1907—a production of 18,750 cubic feet from each retort per 24 hours. The gas sold per ton of coal—which to my mind is the proper criterion of working results—increased from 10,795 cubic feet in 1901 to 12,030 cubic feet for the year 1907. It may be said that it does not pay to take everything out of the coal. But, on the other hand, it certainly does not pay to waste—and we are not yet "Coalite" manufacturers.

The railway rate for the carriage of coal from the collieries to Scarborough is very heavy—about 6s. 7d. per ton. Consequently, the best quality of coal only is used—viz., screened South Yorkshire; and in working with ordinary heats such coal will yield about 10,800 to 11,000 cubic feet of gas per ton of 16½ candles illuminating power. But relying on the carburetted water gas to bring the illuminating power up to the required standard, we are enabled, by working at as high a temperature of carbonization as possible, to obtain a make of coal gas of 12,497 cubic feet, as above mentioned; the average quality being fully 14½-candle power (the standard in the town is 15½ candles), of an average calorific value of 570 B.Th.U. net. The sulphur compounds, other than sulphuretted hydrogen, in the crude gas average 45 grains per 100 cubic feet; and in the purified gas, about 33 grains. But when the purified coal gas is mixed with its proportion of carburetted water gas, the quantity of sulphur is proportionately reduced, and the gas supplied to the consumers then contains only 24 to 25 grains—an amount to which, from a purity point of view, surely no one can take exception. The whole of the gas is purified by oxide of iron; and the purifiers are all under cover. They are kept at as even a temperature as possible all the year round; thus preserving the oxide in a suitable condition for taking out these compounds.

The net cost of the coal gas into the holder for the year ending 1907 works out at 11·05d. per 1000 cubic feet made, and the net cost of carburetted water gas, of 21·35-candle power, during the same period, at 13·36d.; the average net cost of the mixed gases being 11·64d. I may here mention that the whole of the carbonizing, as well as the removing of the coke, is done by hand labour. Although I have shown the carburetted water gas to cost 13·36d. per 1000 cubic feet made—*i.e.*, by charging the coke used in its manufacture at the net average price realized, which last year was at the rate of 14s. 7d. per ton, or 3·24d. per 1000 cubic feet made—I do not consider it fair to water gas to make any such charge, because if the whole of the coke, including the quantity used in the manufacture of water gas, had been for sale, the net average price per ton realized would have been much less. I estimate that the difference between the quantity actually sold at the enhanced price and the amount which would have been realized had the whole of the coke been sold at a lower figure, would extinguish the amount debited to the water-gas plant. I therefore go so far as to say that it is only fair to water gas, when comparing its cost with coal gas, that the charge for coke should not be included in its manufacture.

By this combined system of working, the quality of the gas delivered to the consumers does not depend on the quality of the coal gas; therefore the coal is made to evolve as quickly as possible all the gas that can be obtained from it. In ordinary working, where coal gas only is relied on for the quality of the gas supplied to the consumers, the best gaseous results the coal is capable of yielding cannot be obtained, as the degree of heat and the speed of the exhauster have to regulate quality at the expense of quantity. Had we been working under the latter conditions during the past year, and obtaining only about 11,000 cubic feet of gas per ton to meet the standard quality of 15½ candles in the town, fully 10,000 tons of coal extra would have had to be carbonized, costing £5530 net—*i.e.*, after deducting the returns from residuals—whereas, our combined system of working enabled us to obtain such a large yield of coal gas, and, by enriching same with carburetted water gas, at a cost of £3410, a net saving of over £2000 was effected in the cost of manufacture. The gas delivered consists of 75 per cent. of coal gas and 25 per cent. of carburetted water gas; and this percentage of carburetted water gas is as nearly as possible adhered to all the year round—seeing that it is found to be the amount required to mix with the coal gas to bring the same up to the standard quality in the town.

The advantages of working this combined system are many. Chiefly they are as follows: (*a*) A larger yield of gas can be obtained from the coal carbonized. (*b*) No slow firing of coal-gas retorts is necessary; hence a saving in fuel, wages, and wear and tear of retorts. (*c*) Less coke put on the market for sale, resulting in an enhanced price being realized. (*d*) Less tar put on the market for sale, the importance of which is at present so seriously impressed upon us—unfortunately, to our cost. (*e*) Illuminating power of the gas easier to maintain at a given quality. (*f*) By not depending on coal gas only, one is not left entirely in the hands of the colliery proprietors. And think here what some of these advantages mean, especially during times of such stress as we are at present experiencing. Consider the effect of 25 per cent. of tar being taken off the market—how much better off we should be with regard to the price now obtained for it. Further, consider what would have been the position to-day of many gas undertakings if, when making their contracts during the coal boom last year, they had been in the happy position of not relying solely on coal, but had been able to consume the coke they themselves were producing.

In an able article by Dr. Harold G. Colman in the "Journal of Gas Lighting" for March 17 last, on the four-metre and five-metre "Dessau" vertical retorts, he recommends a similar arrangement of working a separate water-gas plant in conjunction with these vertical retorts. He states "by this plan, it would be possible to add some 20 per cent. of blue water gas to the hot coal gas, and obtain a yield of over 13,000 cubic feet per ton of gas of from 14 to 15 candles and 550 B.Th.U.; and with works of sufficient size to permit of the economical production of water gas in separate plant, it seems to me this plan would be the more favourable under English conditions." The large yield of 13,000 cubic feet mentioned above is a combination of coal gas and 20 per cent. of blue water gas; and on examining the Scarborough figures for last year, I find that for a total quantity of 325 million cubic feet of gas made, 19,406 tons of coal were carbonized—thus giving a yield of combined or mixed gases of 16,736 cubic feet for every ton of coal carbonized.

The working results of vertical retorts that are occasionally published in the technical journals are mostly for short periods only; and experience has taught us that promising results, which are sometimes realized in experimental work or for only a limited period, are not always fulfilled in permanent working. Therefore too much reliance cannot be placed upon them; and until we have the workings of these retorts for an extended period, the writer has yet to learn that, for ease, comfort, and economy in working, better results are to be obtained than those from high temperature carbonization in horizontals working in continuous conjunction with a carburetted water-gas plant.

A SUCCESSFUL METHOD OF WORKING A PREPAYMENT-METER BUSINESS.

By J. E. Morfett, of Sunderland.

[A Paper read at the Meeting of the North of England Gas Managers' Association, Saturday, April 25.]

A little over five years ago the prepayment-meter system was started in Sunderland. In introducing to the public this easy method of obtaining gas, we endeavoured to get into touch only with those who were not already using, or even likely to use, gas through an ordinary meter. In a few cases—perhaps not more than one hundred—have ordinary meters been exchanged for prepayments, and then only for some very desirable purpose. By securing these people as consumers, practically the whole of the consumption through these meters is a gain to the Company. A little difficulty was at first met with in trying to persuade people to consent to these meters and fittings being placed in their houses. However, we successfully overcame this obstacle by fitting two or three complete installations in each street in a chosen district, and leaving same for a few days, with the result that orders soon began to flow in.

For the convenience of working it was decided to divide the town into districts; working one district at a time, until the bulk of the orders were completed. Every street was thoroughly canvassed. This was found of exceptional value; much time being saved in the unnecessary covering of ground by fitters and workmen, and in superintendence. After starting to canvass a colliery village containing above 1000 houses some four miles from town, we learned the place had already been canvassed by a firm pushing high-pressure gas apparatus. The arrangement was to take a supply of gas from our mains, compress it, and supply it to consumers at 6d. per house per fortnight. About 90 per cent. of the householders had agreed to this very economical arrangement; but the scheme fell through.

We have now 1080 installations fitted in this village. A complete installation consists of 60 feet of piping, two brackets and a pendant, a cooking-stove, with 25 in. by 12½ in. by 12½ in. oven, and a three-light meter; ½-inch and ⅜-inch pipe only being used for the inside fittings. An installation complete as stated, including fixing, costs £3 17s. 5d.

In dealing with the business, too great importance cannot be placed on the removal of meters from all empty houses. This, of course, will vary with the town dealt with; but in a busy industrial town where the lower class of labourer and ne'er-do-works abound, meters should be brought into store immediately upon receiving notice of removal. It is necessary to do this to keep down the number of robberies. I have known cases where tenants have been removing furniture in broad daylight from one house to another a few yards away, being absent only a few minutes; and during this time the meter has been broken open and the money stolen. Consumers should be continually reminded of the necessity to give notice of removal; and this can be done by collectors, inspectors, and others. To help in this matter, we place a gummed label on each meter, requesting consumers to give 48 hours' notice. We calculate 75 per cent. of meters left in empty houses would be broken open. Therefore, every 100 meters so left would mean a loss to the Company of £30 12s. 6d. This is made up as follows:—

	£	s.	d.
75 meters left and uncollected, average 5s.	18	15	0
75 ,, disconnected and reconnected at 8d. . .	2	10	0
75 new locks and damage, 2s. 6d. each	9	7	6
	£30	12	6

Another point worth consideration is the systematic inspection of meter installations. This has the following advantages: It remedies any little fault which might put the installation out of use. Cooking-stoves are kept in better condition. It is often found that stoves are disconnected and placed in some out-of-the-way corner. These we are able, as a rule, to have reconnected and brought into use. We can also give valuable advice as to the using of the cooker. It is hoped this inspection will be the means of increasing the consumption; but we are not yet in a position to judge, as it has not been in vogue long enough.

In describing the method of book-keeping adopted, I will start with the registration of agreement forms. These are drawn up containing, as far as possible, a few clauses to protect the Company's interest, as between consumer and Company and landlord and Company. Each form as it is received is examined, and the particulars entered into the "Application-Book." (See specimen No. 1.)

It is then numbered; and as these accumulate, they are packed up into bundles of 1000 and stored away for reference. From the application-book the name, address, and fittings required are entered into the "Fittings Register." (See specimen No. 2.) From this book all work is given out for execution. As soon as each installation is completed, an exact copy of all the material used, &c., is copied from the fitter's report into the "Fittings Day-Book." (See specimen No. 3.)

This book we find most valuable, as it contains a complete record of all installations, including the material used for the service, the installation, the time occupied, fitter's name, &c. In addition to the books described, we keep one to record all slot-meter complaints (see specimen No. 4), and another to enter notices of removal, and called the "Change of Tenants Book." (See specimen No. 5.)

To record the cash collected from meters, we have adopted the Shannon system of filing. The files hold about 130 account forms. (See specimen No. 6.)

Each form represents one consumer. This shows a record of index, consumption, and cash collected for each consumer. We find this system so remarkably effective that we use it exclusively for this work. The principal advantages are: (1) The ease in which new consumers can be added exactly in their numerical order. (2) The district being cut up into smaller units, as it were, saves considerable time in posting from the receipt-book to the file, and from the file to the cash-book. (3) The cost is also in favour of the file system over bound-book systems. These files are kept in two cabinets holding seventy-two. The account forms are made out daily from the "Fittings Day-Book;" the date of filing being entered thereon to prevent a meter being collected immediately it is fitted.

The collectors' day's work is written out in the receipt-book (see specimen No. 7) by an assistant in the office. This book is in duplicate. The front portion is filled in, and given to the consumer, and contains the date, name, address, receipt number, cash

No. 1.—**Application-Book.**

Date.	Application Number.	Name.	Address.	Size Cooker.	Brackets.	Pendants.	If Cancelled, Date.	Why.	Date Completed.	Folio Fittings Register.

No. 2.—**Fittings Register.**

Date.	Application Number.	Name.	Address.	Cooker.	Brackets.	Pendants.	Date Service Completed.	By Whom.	Date Given Out.	Date Completed.	By Whom.	Notice to Corporation.	Fittings Day-Book Folio.

No. 3.—**Fittings Day-Book.**

Date.	Application Number.	Name.	Address.	Cooker.	Meter.	Brackets.	Pendants.	Burners.	Elbows.	Maincocks.	Shelves.	Blocks.	Hooks.	Galvanized Sheets.	Couplings.	Boiling Burners.	Compo.	Time.	Fitter's Name.	Iron Pipe.	Bends.	Elbows.	Nipples.	Reducing Sockets.	Connectors.	Tees.	Time.	Fitter's Name.
																	½" ⅜"			1" ¾"	1" ¾"	1" ¾"	1" ¾"	1" ¾"	1"×¾ ¾×½"				

No. 4.—**Complaint-Book.**

Date.	Name.	Address.	Complaint.	Report.	By Whom Attended.	Date Attended.	Remarks.

No. 5.—**Change of Tenants Book.**

Date of Notice.	Name.	Address.	Moving To.	Date New Form Signed.	New Tenant.	Fittings Day-Book Folio.	File Form Corrected.	Remarks.

No. 6.—**Account Form.**

Meter No. _____ Name _____

Cooker No. _____ Address _____

Date Fitted _____ Date Filed _____

Folio.	Date.	Number.	Index.	Consumed.	Amount.	Folio.	Date.	Number.	Index.	Consumed.	Amount.

collected, and collector's signature. On the duplicate portion only the index is entered. Each book holds 300 receipts, and costs 10½d. We find no difficulty in giving receipts. When the collectors come to the office at night, they each enter their own cash in the cash-book (see specimen No. 8), and copy from the receipt-book the number, name, address, index, and cash, total up the amount collected, and sign same. This completes the work of the collector. The clerks in the office enter particulars from the receipt-book on to the account forms on the files; and from there the previous index and consumption is copied into the cash-book. It is here noticed how a meter is working; the overs and unders are put down in the column provided, and any item of 2d. either way is gone into, and the meter re-inspected if found necessary. By this system collectors never know the result of a meter after it has once been collected; and they never cover the same district twice running. At the end of each quarter, a summary is made of cash collected, overs and unders, and gas consumed.

The collectors, when counting the money on the consumers' premises, place it in paper bags holding 5s. The cash is brought into the office at mid-day, and again at night, and is paid over to the cashier the following morning. Each collector collects from 65 to 70 meters per day; the amount ranging from £15 to £23 per collector. We have five collectors; and the period between collections is at present seven weeks. At the end of each district collection, the files are examined, a list is made of consumers with small amounts, and an inspector is sent round to ascertain the cause, and to urge the people to make better use of the fittings provided.

In addition to the books already described, there are several more in use; the most important being one called the "Collector's Daily Report Book." (See specimen No. 9.) This contains the name of the collector, the number of meters, and the amount of cash collected for each collector per day; also the district where working. It thus shows at a glance the result of each day's work. Another is called the "Overs and Unders Account Book." (See specimen No. 10.) In this book an account of the "overs" and "unders" for each day's work is recorded, together with two reference columns from the cash-book, and also the previous collector's name and the amount of robberies. At the end of each month, a summary is made of these particulars.

No. 7.—**Receipt-Book.**

_____ 190

SUNDERLAND GAS COMPANY. **21300**

SLOT METER DEPARTMENT.

Received *from M* _____

_____

the sum of _____

_____

COLLECTOR.

_____ 190

SUNDERLAND GAS COMPANY. **21300**

SLOT METER DEPARTMENT.

Received *from M* _____

_____

the sum of _____

Index to Meter _____

_____ COLLECTOR.

No. 8.—**Cash-Book.**

Date Last Collection.	Date Present Collection.	Receipt No.	Account Form No.	Name.	Address.	Present Index.	Past Index.	Consumption.	Under.	Over.	Amount.	Paid to Cashier.	Collectors' Signature.

No. 9.—**Collectors' Daily Report Book.**

Date.	Name of Collector.	No. of Meters Collected per day.	Amount Collected.			District Collecting.
			£	s.	d.	

No. 10.—**"Overs and Unders" Account Book.**

Date.	Cash Book.		Previous Collector.	Overs.		Unders.		Robberies.			Remarks.	Total Overs Per Day.			Total Unders Per Day.			Total Robberies.		
	District.	Folio.		s.	d.	s.	d.	£	s.	d.		£	s.	d.	£	s.	d.	£	s.	d.

The following table shows the progress of the business in Sunderland; the first installation being fitted in March, 1903:—

Year.	Total Installations Fitted.	Installations Fitted Each Year.	Gas Consumption.	Average.	Cash Received.
			Cubic Feet.	£ s. d.	£ s. d.
1903	1,650	1650	3,571,200	..	597 2 8
1904	5,861	4211	29,396,500	1 6 2	4,913 16 0
1905	10,527	4666	64,771,900	1 6 5	10,829 5 7
1906	12,540	2013	94,378,200	1 7 3	15,729 14 2
1907	13,882	1342	117,153,100	1 9 6	19,521 1 8

It will be noticed that the average yearly consumption per consumer is somewhat low; but perhaps this can be explained partly by the fact that about 25 per cent. of our consumers are colliery workers, and get a supply of coals free. Therefore the most important part of the installation—that is, the gas-cooker—is not required. Further, we have not encouraged changing ordinary meters for prepayments, but have endeavoured to get hold of those people who were not using gas; and these we find are principally of the labouring class, and whose wages do not allow them to use gas to any great extent.

Discussion.

The PRESIDENT said the forms which Mr. Morfett presented were of much interest; and he had no doubt they would be looked at and compared with those which the members might have in use in their respective undertakings. Inasmuch as the Sunderland Gas Company had a system of fitting stoves free, and the custom prevailed of removing the meters when the houses were empty, he would like to inquire whether they found it necessary often to remove the fittings from these particular houses.

Mr. T. M. WALLER (Durham) asked what was the practice with regard to returning to the consumer where there was found to be an excess of money. Where there were a lot of collectors, and they changed their districts, it might be a little awkward, unless they had some arrangement as to this. But in a case like his, the collector knew at the time if there were anything in excess; and, of course, it was returned.

Mr. A. B. ROXBURGH (Newcastle) inquired how the amount of £3 17s. 5d. was made up. He would also like to know, in regard to colliery houses, whether the Company differentiated where they included a cooker or simply a boiling ring or griller or something else, as his experience of colliery houses was that cookers were never used. They had very little necessity for a cooker. Some used them; but the percentage was very small. The question that Mr. Morfett had raised about the changing to automatic meters from ordinaries was one which was of interest to him, because, although they might come into a district where at present there was no gas used, and they fitted up the houses, and tenants were coming in from other districts where ordinaries were installed, they might have objections to the use of the automatic installations.

Mr. F. P. TARRATT (Darlington) said he noticed that Mr. Morfett mentioned that the consumption per meter was somewhat low, which was undoubtedly the case. It would be interesting to know what number actually had cookers. He had always been disappointed in Darlington at the average consumption, which amounted to about 10,000 cubic feet per consumer per annum. Just under 50 per cent. were supplied with cookers. It was his endeavour at present to keep the cookers working as much as possible; and he was arranging to have them regularly inspected. If he found that cookers were not being used, he took them out. It was rather a curious point that in many towns where they had grillers in use the consumption per meter was as good as where they had cookers. The price of gas charged through slot-meters might have something to do with this. If it were thought to be somewhat high, the effect would certainly be to reduce the consumption. The President had raised a point upon which he would like some information—that was, the reduction in the price of gas through slot-meters. In Darlington it had proved more satisfactory to give discount to consumers, because they more readily gave notice when they were leaving, as when they had 6d. or 1s. to receive they looked for it. His book-keeper told him he had no difficulty in the matter. He certainly thought that collections should be frequent. It was a great temptation to leave money long in the meters, especially in towns where distress prevailed. He always endeavoured to get round in six or eight weeks; and he found they suffered less from robberies through doing this.

Mr. MORFETT said he had scarcely found it necessary as yet to remove fittings from houses—in only about two cases. At the present time there was great distress in Sunderland, and they were sometimes removing as many as thirty meters a day; but sometimes they fixed as many as twenty. They had had no occasion so far to give a rebate to any consumer. They did not return anything to consumers with ordinary meters when they found that the meter was working absolutely wrong. In colliery houses, they only fixed a griller. They had tried to introduce gas-cookers into these houses, but found that they were not being used. As to the cost of the installations, the exact figure he did not know; but if anyone were particularly anxious to know, he might communicate with him. They did not put in pipes for the landlords. The proportion of installations fitted with cookers would be about 70 per cent.

DEPRECIATION AND KINDRED MATTERS.

By CHAS. H. ARMSTRONG, Secretary of the Walker and Wallsend Gas Company.

[A Paper read at the Meeting of the North of England Gas Managers' Association, Saturday, April 25.]

A year ago, Mr. Herbert Lees, in his admirable paper read before this Association, on "Some Notes on Capital Charges," presented factors affecting which a sound administrative policy is of the greatest importance. Dealing with capital charges relative to necessary developments, Mr. Lees said: "The extension must nevertheless be carried out; and if wisdom has been exercised in the provision of a *reserve fund*, the undertaking will generally be able to meet the increased capital charges without raising the price of gas, and will readily adapt itself to the new conditions." The italicizing of "reserve fund" is my own; and it is to such-like and kindred provisions we should look to meet the extra charges upon increasing developments, &c. The position is not an agreeable one when provision for structural additions must be met by having immediate recourse to the raising of the price of gas. A strong position can only be attained by the building up of the authorized funds, together with a requisite and systematic method of depreciation; and it follows that such application must to a great extent guide operations.

It is evident there is a great deal of confusion in the minds of gas officials as to whether or not it is illegal to provide for depreciation in addition to the regular specified funds. At the same time, the divergent views and differences of opinion of eminent accountants, regarding the meaning, creation, and application of depreciation, reserve, and such-like funds, are so marked that the subject is one deserving of some consideration and endeavour to elucidate some of the difficulties arising, especially as regards the more modern legislation of gas companies working under the provisions of the sliding-scale. Parliament, in its wisdom (*vide* Model Gas Bill), provides only for certain funds, the formation and building up of which are left optional—viz.: Insurance fund, formed out of surplus profits to meet any extraordinary claim or demand, &c., and limited to one-twentieth of the paid-up capital; reserve fund, formed out of divisible profits to make up future dividends, and unlimited; net revenue account, for surplus profits, which may be carried forward year by year without any limitation. In some cases Parliament has granted a renewal fund, while in others restrictions have been placed upon the amount carried forward in the net revenue account. It has not, however, specified any direct provision or guidance for depreciation other than for works on leasehold lands; and it thereby implies that ordinary depreciation, replacements, and when displacements by extraordinary extensions are contemplated, have to be met by some means or other through revenue.

With all gas undertakings a time comes, sooner or later, when it is necessary to supersede old plant, &c., by more up-to-date apparatus. It is within the power of Parliament to raise up such a position prematurely, following which, a company, if they have not exercised great care in their finances and working policy, will no doubt become heavily burdened with unnecessary extra liabilities. For instance, the Company to which I am attached were obliged, at the commencement of their career, prior to receiving parliamentary powers, to erect separate works upon leasehold lands. In 1903, a Bill was promoted to acquire, along with other matters, the freehold of the works, and to enlarge and extend the existing works upon adjoining vacant land communicating direct with an adjacent railway. To meet the ever-increasing demand for gas, considerable, but gradual, extensions were essential. Notwithstanding this, however, the Committee of the House of Lords would not grant the powers required as against the will of the landlords (the only opposers), although the necessary extensions were not challenged, no one would have been disturbed, and the works would just have gone on as usual in the interests of consumers and shareholders alike. The position of a statutory company is very different from that of a private company. In the matter of charges, definite obligations are imposed by Parliament for the protection of the consumer. Therefore, a statutory company going to Parliament and requesting further provisions to carry out these obligations should have the assistance of Parliament to this object; whereas the refusal placed upon my Company the premature burden of extraordinary extensions, in the providing of a complete new site and works in another part of the district. It appears important in the highest degree that provision should be made with regard to contingencies to cover displacements, &c. Obsolete capital should be written off somehow or other, and precaution ought to be taken thereto.

The value of a gas undertaking is in its earning powers and maintainable profits; the revenue account being the basis from which provision must needs be made towards its continued welfare and security. As gas undertakings are fundamentally manufacturing concerns, the continued expense due to the wasting of what is the positive profit-earning factor—*i.e.*, plant and machinery—must to a great extent affect the revenue profits. Expense is continually accruing for the usual wear and tear; and it follows that the more liberal directors are to make good the loss in earning capital during the year, the more able they will be to maintain the level of profits. In general practice, the usual maintenance for

wear and tear does not suffice to cover the fixed value of earning capital. How may directors therefore provide against displacements of an extraordinary character, provision for which is clearly essential and as important as wear and tear maintenance? It is a matter requiring careful and constant attention and cautious handling.

The method of keeping accounts, in accordance with the Gas-Works Clauses Act, 1871, is that of what is termed the double account system. This provides that capital expenditure should always be maintained and shown in the statement of accounts at its original cost; renewals, &c., being charged to the debit of the revenue account. It has been suggested that Parliament hereby certainly contemplated, and indicates by omission, that no direct depreciation fund should be made, and that all replacements should be dealt with through revenue at the time accruing. If this be admitted, it is reasonable to assume that any expenditure of an extraordinary character such as displacements, &c., were not thought of at the time. Something is wanting. On the other hand, it has been suggested that, in the absence of express legislative prohibition to provide a fund systematically out of profits for depreciation, arrangements thereto are left to the executive to provide as they think fit in the interests of the company. The net revenue account, with its allowable unlimited accumulation of surplus profits, supports this assumption. It has been legally decided that the control of this account is entirely in the hands of the company; and if it is to the interests of the company to carry forward reasonably substantial balances, it is to the interests of the consumers, which are identical with those of the company. The Companies Clauses Consolidation Act, 1845, is generally incorporated with Special Acts, except where expressly varied; and clause 122 provides for a fund being set apart out of the profits for enlarging, repairing, or improving the works. This does not appear at one with the purpose of the modern reserve and insurance funds; the latter being to meet any extraordinary demand, &c. It is doubtful whether the modern conditions, as provided in the Special Acts, vary and annul this clause. No judicial decision has been given on the point.

The proviso at the end of the reserve-fund clause—viz., "save as in this Act otherwise provided no sum shall in any year be carried by the company to any reserve fund"—is a distinct prohibition against the raising of further like funds; but it must not be overlooked that the clauses for the insurance fund and the net revenue carry-forward commence with "if the clear profits." What are "clear" profits? A case was heard before Mr. Justice Farwell wherein certain preference shareholders claimed arrears of dividend to be paid out of accumulated balances in the profit and loss account (net revenue account); the directors contending, in defence, that as such balances were arrived at without taking into account, or making any allowances for, ascertained losses in capital account which exceeded the amount of the balances, they were not applicable for dividend until the losses were made good. Mr. Justice Farwell, in giving judgment for the defendant company, with costs, expressed his opinion that there was no hard-and-fast rule by which the Court could determine what was capital and what was profit; and he then quoted the Lord Chancellor in another case—viz.: "It may be safely said that what losses can be properly charged to capital and what to income is a matter for business men to determine, and it is often a matter upon which the opinions of honest and competent men will differ. There is no hard-and-fast legal rule on the subject." Also, with regard to profits, he quoted Professor Marshall's definition—viz.: "The excess of the receipts from the business during the year over the outlay for the business; the difference between the value of the stock and plant at the end and at the beginning of the year being taken as part of the receipts or as part of the outlay according as there has been an increase or decrease of value."

The reference suggests depreciation upon wasting assets being ascertained and provided for out of revenue, and where the ascertained losses and wastage of capital are equal to, or exceed, the amount standing to the credit of profit and loss account, dividends need not be paid until the losses are made good. In other words, wasted or obsolete capital may be written off, and some method for the purpose adopted. There being no general principles of law regarding how clear profits are to be ascertained, the matter is practically in the hands of the directors to express as they think fit. The Courts in other cases show that the policy of the directors is not interfered with when exercised in the interests of the company. A sinking fund is optional. Disused or obsolete capital may or may not be written off through revenue; but it must be admitted that a fundamental principle in the carrying on of a concern is to make it commercially sound; and if no provision out of revenue is made for replacements of wasted capital, and profits are divided up to the hilt, it may be inferred that dividends are paid at the expense of capital.

The treatment of accounts (Gas-Works Clauses Act, 1871), being of the double account system, suggests that the principal object is to simplify accounts to the understandings of shareholders, consumers, and all concerned, at the same time giving a full, accurate, and self-explanatory position of the doings of a company. It is, however, most important to discriminate between "funds" and "accounts." A difference between the terms is fully recognized by eminent accountants; but there is no special agreement as to their use and meaning. It appears to me that provision out of profits for funds is misnamed unless represented by distinct investments. The formation of reserve and insurance funds is quite optional. In the first place, accounts rightly created are placed on the liability side of the balance-sheet. The account, however, is not the fund. A fund is an asset, and cannot be placed among the liabilities. To justify its title, it must be represented in a concrete manner on the other side of the balance-sheet, by investment outside of the undertaking, to serve safely and readily its specified purpose. The clauses enacted indicate funds of investment of which nature no further funds are contemplated. By their creation directors should not be deprived of forming accounts by way of profits set aside, to be used to cover recognized liabilities by obsolescence, until such time as the capital in question actually becomes obsolete, when the account may be squared off by the cost of the necessary replacement, leaving the original capital cost undisturbed.

When not specially invested, such an account is merely of a book-keeping nature, and should not in any manner be confused with a reserve fund. The word reserves might be kept out of the heading altogether, and others adopted—*e.g.*, "Provision for Replacement of Old Plant," "Provision for Renewal of Plant," "Provision for Maintenance of Plant," or "Accrued Liability for Replacement." Under this system, the cost of replacement would be debited against the account as it occurs. After the first few years, the balance would not be continually increasing, but would, although varying from year to year, represent at any time the expenditure required to be incurred to bring the asset up to the value as new plant. When a company is very prosperous, a plan is sometimes followed of writing-down the fixed assets by debiting revenue and deducting from the expenditure of capital, without creating a special account. Such writing-off leads to depreciating the real asset below the original cost, which is not in the spirit of the Act of Parliament. Parliament, in its wisdom, or otherwise, does not impose a clear issue for depreciation as to freeholds. May we therefore assume from the foregoing that a depreciation account is allowable for fixed assets.

Regarding leasehold amortization, it is necessary that a complete analysis and summary of the whole of the company's capital expenditure be on hand, in order to ascertain and establish the correct loss of capital by reversion to the landlords. When this is correctly kept, a redeeming fund must be created by setting aside a fixed sum appropriated from profits year by year, which, lying at compound interest and accumulating, will be sufficient to clear off the loss of assets involved. This fund may or may not be invested in some outside securities. In a policy of investing the fund outside the undertaking, it must not be overlooked that relative capital would have to be issued in stock, mortgage bonds, or debenture stock; and it clearly follows that arrangements thereto must be borne in mind. Under certain circumstances it is inadvisable to invest outside. The Company in which I am interested are erecting new works upon freehold land to ultimately take the place of the two old works. This position is due to the negative action of Parliament (to which I have previously referred) necessitating making provision 30 years before the expiration of the leases. From a full and complete analysis of the old works expenditure to date, it is found that ultimately the dead capital will about equal the cost of the new works. Provision for this, hitherto and for the future, is met by an amortization fund to which £500 per annum is placed, accumulating at 4 per cent. compound interest. This fund is invested so far in the new works, and will be continued so, to meet the general developments of the undertaking. At the end of the leases, the matter resolves itself into an adjustment of accounts, by which the amount representing the old works will be transferred from the amortization fund crediting capital expenditure—the amount, of course, having been expended in the new works. It may be noticed that the £500 per annum forward comes out of profits earned principally by the new works; but as it is intended to keep the four gasholders, appurtenances, &c., going to the end of the leases, £500 per annum is not an exorbitant rental.

Now as regards a proper course to pursue as to depreciation of freehold works. A custom that is much in vogue is to delay for a time any depreciation upon new plant and machinery, considering that for the first few years there is no appreciable deterioration, and that consideration should only be given when deterioration is marked. Such policy is certainly wrong. All plant should earn its own replacement. Although gas plant be kept up to an efficient working order, it should never be overlooked that the structural value is from the first gradually depreciating. The scheme which commends itself as the most equitable is to deal with the life of the various fixed assets, setting aside every year amounts to depreciation accounts towards ultimate replacement. For this purpose a systematic apportionment to the asset is necessary year by year; but it cannot be assumed that the apportionment be precisely estimated. The life of the asset may be of longer or shorter duration, and the cost of replacement more or less than the original cost. In determining the life and the amount to be set aside, each asset in question should be separately and specially considered upon its own merits; and it should not be overlooked that, where repairs and maintenance are slack or neglected, the more rapid the depreciation, while the more maintained the greater the life. No universal or distinct rule of percentage can be prescribed for general acceptance; circumstances and conditions vary so much. The assets to which replacement accounts are deemed necessary are: Buildings and tanks generally, gasholders, purifiers, condensers, washers, exhausters, station meters, governors, boilers, pumps, locomotives, gas-engines, machines, mains, &c., retort-house machinery, fittings, sulphate of ammonia and other plant, &c. It is quite obvious that no life

adjustment for replacement is needful where it is possible to keep up by a system of repairs and maintenance the original structural value; hence the omissions from the foregoing of retort arches, settings, producers, railway sidings, &c.

Various methods of apportioning annual revenue charges towards replacements are in use. It is unnecessary to discriminate and to deal with each at length; so I narrow matters towards a method for appreciable adoption. One scientific theory is by a fixed percentage upon a yearly reducing value, resulting in the amount of charge to revenue falling gradually smaller year by year. It is apparent that in the earlier years of life the wear and tear is much less than in later years, which suggests that plant, &c., should in its earlier years contribute all the more to its replacement. For example, upon a nominal asset value of £100, it takes 13 years, at 20 per cent., writing down, year by year, to a residual or scrap value of about 5 per cent.

	£ s. d.
1.	£20 0 0
2.	16 0 0
3.	12 16 0
4.	10 4 10
5.	8 3 10
6.	6 11 1
7.	5 4 10
8.	4 3 11
9.	3 7 1
10.	2 13 8
11.	2 2 11
12.	1 14 4
13.	1 7 6
	£94 10 0
Residual or scrap value	5 10 0
	£100 0 0

Perhaps a more prudent and better method to employ, where gas-works are systematically maintained in efficient working order, and tending to an easily worked general application, is to charge to revenue in equal annual sums to the different classes of assets, which might be grouped, although at the same time detailed subsidiary accounts are important, for which a separate and special ledger is needed, the aggregate of which agrees with the general applications. The matter of the rate to be provided for is the life of the asset turned into an equal annual percentage. This example, taking the structural values of the new works of the Company referred to, which are to produce 450 million cubic feet of gas per annum, works out approximately—

	Life. Years.	Cost. £	Per Cent.	Annual Depreciation. £ s. d.
Gasholder and underground tanks, foundations, &c.	100	5,000	1	50 0 0
Buildings generally, roofs, boundary walls, gates, &c.	75	11,000	1⅓	146 13 4
Gasholders, purifiers, works mains, buildings for sulphate plant, &c.	40	11,300	2½	282 10 0
Stage flooring, bench bracing, fittings, &c.	30	3,500	3⅓	116 13 4
Condensers, station meters, governors, distribution chambers, &c.	25	2,000	4	80 0 0
Condenser mains and tank, Livesey washers, exhausters, pumps, boilers, gas-engines, electrical plant, locomotive, oxide shed, producer plant, retort-house machinery, weighing machines, &c.	20	7,000	5	350 0 0
Scrubber-washers, sulphate plant, &c.	15	1,250	6⅔	83 6 8
				£1109 3 4

Provision for possible antiquation or displacements is partially met by the adoption of either of the foregoing methods—more expedient perhaps by way of the former, where a greater proportion of the original cost is provided for in the earlier years of life. The latter, however, may be further supplemented by way of augmenting the balances (which in course of time will be fluctuating balances) by crediting interest.

Distribution capitals—mains and services, installations, &c.—are of a somewhat different nature, and need separate consideration. Being entirely on foreign property, they do not come under direct control, and proper supervision is requisite to determine the needful towards maintaining original value. Parts of mains and installations are brought up to their original value direct out of revenue from time to time by new pipes and articles as required; but as this is a patchwork course of procedure, it cannot be expected that the value of the capital lying out is equal to the original cost. A system of primarily depreciating to a fair working value might be adopted. So near a relation exists between capital and revenue that there should appear no difficulty in a judicious and methodical handling. The initial writing off with regard to mains and services, installations, &c., is not of an extraordinary nature. Their replacement is gradual, and revenue will receive a fair return quite in touch with the development. For this purpose may be taken the cost of services from the main, piping, and all unremovable materials and labour, amounting to about three-tenths of the total cost; leaving in capital account the balance of seven-tenths (under the circumstances a fair working value) represented by the total street-mains and all removable articles—*i.e.*, meters, stoves, and fittings—which need no further depreciation beyond being kept up to a good working condition by repairs and renewals direct from revenue year by year as required. By this system, street and house registers can be kept in complete detail, agreeing in the aggregate with the nominal ledger.

In considering the question of the carry-over in net revenue, there seems to be no necessity to augment this account, providing fixed assets are prudently depreciated, beyond more than may be sufficient to cover about one year's obligations. Its principal object doubtless is towards meeting a shortcoming in profits resulting commercially—*i.e.*, by extraordinary costs of materials such as we are at present undergoing in the increased cost of coal. High coal prices are generally of short duration; hence there should be no need to constitute the account as it were into a general reserve account. Many gas undertakings, by having a sufficient balance in net revenue account, have weathered over such periods without having to raise their price. The opposite policy is evident with some companies, who, instead of carrying forward surplus profits, reduce the price of gas whenever the balance will allow it. It is, however, gratifying to realize that, as a rule, the price of gas does not vary nearly so much as the price of coal.

As I said earlier in this paper, the value and security of gas undertakings are in maintainable profits, and it is with regard to these wherein lies the issue towards sound administrative policy. Gas companies display vast differences of opinion in regulating their financial matters, and with regard to those with haphazard methods, wherein the financial policy is not clearly defined by some systematic scheme, the results cannot be said to be of a permanent character. Profits as a rule grow slowly; and their relation to capital is of first-rate importance. One looks to the capital of a manufacturing works to be as near as possible fully employed; but gas undertakings, on account of their nature, cannot be expected to be so. Additional capital to meet future demand is unavoidable; and the consideration as to what extent provision should be necessary is often a very perplexing one, especially when it is realized that profits must be spread over the existing as well as over the new capital, until the latter becomes remunerative. From the results of my Company's operations, I think encouragement may be given to a forward construction and development policy. For instance, taking the last two periods of seven years, we have—

	Capital Expenditure per Million. £	Gross Profits. £	Net Charge for Gas per 1000 Cubic Feet. s. d.
1894	585	5,528	2 4·155
1900	390	5,539	2 3·932
1907	640	11,488	2 0·698

During the first period, the existing works were gradually utilized to the point of their utmost capacity, resulting in the capital expenditure per million gradually decreasing to the exceedingly low figure of £390—the lowest in the annals of the Company; while the profits practically remained the same. During the same period, the charge for gas reached 2s. 1·584d. per 1000 cubic feet, but returned in 1900 to about the same figure as in 1894. Just before the year 1900, a forward and aggressive policy was instituted, with the result that, although capital expenditure has gone up by leaps and bounds, the profits have followed in greater proportion, notwithstanding the price of gas having been reduced by over 3d. per 1000 cubic feet.

The present capital expenditure of £640 per million cubic feet appears high; but it must not be overlooked that the old works will shortly be dead capital, to be written off. At the same time, the new works are able to produce 50 per cent. more than the present output; hence I look forward to a considerable reduction in the future, when gross profits, under normal conditions, should also result in a similar favourable manner. Further, the conditions arising at the new works—improvements in labour-saving and other appliances, position, and concentration—point, upon the change over, to an immediate saving adequate enough to cover depreciation and interest upon the additional expenditure.

Discussion.

Mr. H. Lees (Hexham) presumed that most of the members would find some difficulty in discussing the paper. He felt himself that Mr. Armstrong had so thoroughly dealt with the subject of depreciation that almost nothing remained to be done except to agree with what he had said. The importance of the subject could not be over-estimated. Financially, the strength of the gas industry was very largely due, he thought, to the legislation that had taken place, which limited dividends, in conjunction with the auction clauses, and which also made provision for the establishment of certain reserve funds; and the more a company—he was speaking of companies—had regard to the provision of such funds, the stronger was its position. But there was a weakness, he had always felt, when dealing with exceptional expenditure. A reserve fund was for a specific purpose. An insurance fund was also for a specific purpose, and could not be directly used for the replacement of plant—except in so far as, indirectly, it came into operation. When an undertaking required to make a considerable replacement of plant during a particular year, it might not be applied to meet its dividend account; but this replacement might be made out of revenue, and then the reserve fund came into operation in supplementing the dividend account. Ordinarily these funds were not available; but they all knew that, under some circumstances, the expenditure might be excessive—in the renewal, for instance, of a large gasholder or a retort-bench. This might be a considerable item in the expenditure of one year; and to take the amount out of one year's revenue would be too

much (though it would be quite correct, and in accordance with the book-keeping clauses of the Gas-Works Clauses Act of 1871), because it would seriously cripple the profits for that year. In fact, the outlay might be so much as to entirely prohibit it being taken during one year. There were several methods by which the difficulty could be overcome. One was to form a suspense account. There was nothing in the Acts of Parliament which provided for this; but he was not aware that there was anything in them to prohibit it. Therefore it seemed to be a prudent method to provide temporarily a suspense account for wiping off these exceptional expenses. Mr. Armstrong's provision, to his mind, was a much saner one. It provided for the saving of the plant at the time; and this seemed to be a sensible method. How far it complied with the Acts of Parliament, he could not say; but, assuming it did, it seemed a much better method to adopt than that of a suspense account. They did not really obtain much help from the Companies Clauses Consolidation Act of 1845. The clause referred to by Mr. Armstrong—section 122—read: "Before apportioning the profits to be divided among the shareholders, the Directors may, if they think fit, set aside thereout such sum as they think proper to meet contingencies, or for enlarging, repairing, or improving the works connected with the undertaking, or any part thereof, and may divide the balance only among the shareholders." But this Act was passed before the Gas-Works Clauses Act of 1847; and therefore the provisions as to a reserve fund would appear (he was quoting from "Michael and Will") to supersede that, or to take its place, so far as gas undertakings were concerned. Then there was also the additional fund for insurance. They did not get much help from the Acts of Parliament on these points; and where exceptional expenditure did take place, it would appear that they were left with some amount of discretion. There were differences of opinion among experts, as was evidenced by the quotations from the judgments referred to by the author of the paper; and they would probably continue to have these differences. It would scarcely be possible, in Acts of Parliament, to make provision for every detail; but if they proceeded on general principles, they might be regarded as having done their duty to their obligations. There was one other point—the investment of reserve and insurance funds outside the undertaking. If a fund were invested in the undertaking, it certainly was not serving the purpose for which it was intended. It must be invested outside the undertaking if it were to be a proper reserve fund. He knew that to invest it inside saved some working capital and interest. This might be to the benefit of the consumer; but it was certainly not in the interests of the shareholders that the reserve funds should be invested in the undertaking. The wise course should be adopted of allowing these funds to have separate existence. He offered his congratulations to Mr. Armstrong upon his interesting paper. It was one they would be able to refer to as being an authority on the question of depreciation.

Mr. J. H. Hill (York) said there was one matter which interested him—namely, what provision might be made for depreciation in the investments into which Mr. Armstrong said they ought to be careful to put their money. This was an error into which many companies had fallen in their investment of funds. There was a very great depreciation, as everybody knew, in the market value of investments. In his case, they thought it advisable to make them up to the normal value; but they found that the Act of Parliament precluded it. This raised another question, to which Mr. Armstrong had not referred—viz., appreciation. He had seen the matter brought up in rather an interesting way. In a certain undertaking there were two directors, one of whom was a wine and spirit merchant and the other a draper. One wanted to know how they took their revenue stocks, and he was told that they were taken at cost price, with a good margin left for depreciation. The wine and spirit merchant said it was quite the opposite with them, because every year the stuff was in their cellars the more valuable it became. They heard a great deal about "unearned increment;" and it was good to know that there was an unearned increment relating to gas-works—in the value of their works and businesses. They might embark, for instance, upon such business as that of supplying prepayment gas-meters, and put a lot of piping into houses, which would be practically valueless as soon as they fixed it, except for the fact that they hoped to retain gas consumers. But it was necessary to allow for depreciation. He was once in conversation with a gas-fire manufacturer, and he asked him how they would ascertain the value of their undertaking if they were to form it into a limited liability company. The manufacturer replied that he thought they would be quite right in putting it at the value of a 5 per cent. dividend. He (Mr. Hill) wondered whether the 5 per cent. was meant to be calculated in good or in bad times, because, of course, there was a great deal of difference between the one time and the other. With reference to the carry-forward in the net revenue, of which Mr. Armstrong had spoken, they always had a pretty good floating balance in that way. They never had to dip into it to any great extent.

Mr. W. Hardie (North Shields) appreciated the manner in which the subject had been brought forward. It was a very difficult one, and a matter upon which he believed, from the paper itself, and from the discussion which had already taken place upon it, there were no very definite or orthodox lines. There were one or two items relating to the works which Mr. Armstrong represented that were worthy of notice by them all. In the first place, there was the question of building gas-works upon leasehold or freehold land. He thought Mr. Armstrong would have discovered by this time that it was an enormous advantage to have buildings upon freehold land, and also that it was profitable to have sufficient land for a very large future extension. He understood this was the plan their friends were going upon at the present time. He must congratulate Mr. Armstrong upon the figures he gave towards the end of his paper. It was a very satisfactory statement; and he felt sure the Company were on right lines as regarded depreciation, and that they would reap very considerable benefit from this later on. As to depreciation itself, it seemed to him the thing was very largely a question of keeping accounts; but it did appear that this was not altogether the most difficult part of the question. It was very easy, if they had settled the amount of depreciation they wished to allow for, to write it off year by year, or to write a specially large amount off in any particular year. But they would notice in the paper that the lifetime of certain portions of the manufacturing plant was given. This lifetime, as they all knew, varied, upwards and downwards, by possibly some hundreds per cent., if they took into consideration the way in which the structures were put up, and the manner in which they were maintained from year to year. They might have a structure put up not much stronger than a spider's web; but, on the other hand, they might have one something like those tombs they found outside Rome, which appeared to have been intended to last till the Day of Judgment. As regarded a suspense account, or other method of providing for renewal, if they had this they would be travelling outside the rules of parliamentary regulation. It would be a nice thing to have such funds. In their own case they tried it. They created a plant renewal fund, to which they put a few thousand pounds for gasholder extension or something of that sort; but when they went to Parliament, they were told that it must not appear again. He might say it did appear again. While they were not allowed to have a plant renewal fund, there was not, speaking generally, any restriction as to the amount carried forward, though he knew that there had been one or two cases in Parliament where there was such a restriction. But they had a large reserve fund and a large carry-forward, which, in normal times, were amply sufficient for any renewals that were likely to take place. With regard to the amount to be allowed for depreciation, he thought that Mr. Armstrong was very much on right lines in the table he gave as to the life of the plant.

The President said that some years ago, when they were carrying out large extensions, and gradually working out disused and obsolete plant, of the value of between £6000 and £7000, they felt if this was to become a charge upon revenue all at once, it would be more than the undertaking would bear. Therefore they opened an account which they called a disused plant account, to which was carried a sum that, in the aggregate, amounted to the first cost of the disused plant, less the value which they expected it would realize as scrap. This went on satisfactorily until their balance-sheet had to be presented to the Surveyors of Income-Tax; and they declined to allow these annual charges to be made against revenue, unless the transactions were terminated. The Company appealed to the Special Commissioners of Income-Tax, in the hope of showing them that the Surveyors had taken a wrong view. The Commissioners were very obstinate; and he had some difficulty in coming to an arrangement with them. However, ultimately they decided that, upon the completion of their works, and the closing of the accounts, they would give a rebate equal to the amounts which they had added from year to year. After interminable correspondence and interviews, much to the surprise of his Directors, he received at last a cheque of a very substantial character, by way of rebate. It was features of this character which were a drawback to the excellent proposals of the author; and it was on account of drawbacks such as this that he advocated very strongly legislative power to create funds other than reserve and insurance funds, so that they might be able to debit this particular account with sums which had a relative proportion to the cost of the plant, and the life of the plant. It appeared to him that by such means they should also be able to equalize the charge which appeared under repairs and maintenance, whether these were incurred in connection with manufacturing or the distributing plant. That the equalization of these charges would be desirable, was, he thought, within the experience of most of them, as was evidenced by a perusal of the analyses of gas accounts which were presented to them from time to time. If they could overcome this difficulty, and also the difficulty he had experienced, it would be a very desirable object. The paper seemed to him to be a very excellent accompaniment to that which was presented to them twelve months ago by their friend Mr. Lees.

Mr. Armstrong, in closing the discussion, said he felt, in reading the paper, that he was taking upon himself a very difficult matter; and from the researches he had made, he had found it to be so. The matter of depreciation was of importance to all classes of members; and he would have liked to have heard some of the traders state what they did in connection with the subject. The more they went into the question, the more bothersome they would find it to make out a distinct and satisfactory way of dealing with depreciation. The whole thing was really a problem of economic science, because they found accountants—most eminent men—differing completely as to what should and what should not be regarded as profits. They might read books or a paper on the subject; but, at the finish, they would find they were still doubtful on the whole question. When they isolated the matter, as he had done, and confined it to gas companies working under sliding-scale powers, he thought they might come

to some ultimate conclusion as to how depreciation might be settled. Of course, the principal thing was the legal point in connection with it; and he found that one or two members had shown a little apprehension thereof. In dealing with a certain matter, he had to speak to the present Attorney-General about a clause which was very doubtful; and he said the only way in which to legally settle such a doubt was to go to the framer of the clause and ask him what its original intention was, and let the original intention be taken as the most equitable settlement of the matter. The question of depreciation was not mentioned in the Act of 1871; but it did not follow that they must not touch it. If depreciation had been referred to in the Act, they would have been bound, in honour, to have paid some attention to it, unless they had some provisions in their Special Acts to govern the matter. But depreciation was not there; and therefore he thought they might assume that the intention, when these clauses were drawn, was to let companies do as they thought fit. This was his position. He did not think the apprehension of two or three members ought in any way to affect the policy, when they found that this policy of replacement was a proper and justifiable one. He saw that day a case where the Borough Accountant had brought up a matter in connection with the Brighton and Hove Company, in which a gasholder had become obsolete, and £5000 had to be written off against the holder. The Accountant, however, drew attention to the view that the most prudent method was to provide for such obsolescence beforehand. This seemed to show that the proper way to meet depreciation was to do it in the way he had suggested. One gentleman mentioned the matter of appreciation. In statutory gas companies it was a general principle that this was not allowed. In the form of accounts appended to the Act of 1871, it was distinctly shown that they must keep the capital at its original value. Suppose they took account of appreciation, and any shareholder objected, they could write it back to their other accounts. He always held that everything must be above-board, and ought to be so placed before the shareholders, and anybody else, so that they could see exactly the working of the company. The question of fixing the life proportions of the plant was a difficult one; but, of course, whether or not they did so correctly did not matter. The example he gave was sufficient. A great deal depended upon the quality of the material they put up. Only in the previous week he had raised the question of having a rebate upon income-tax for the whole of the old works which were becoming obsolete. The representative there would not commit himself, but he felt that he was quite agreeable to it; and the next thing must be that correct figures should be sent up to London to be discussed there.

Gas Companies and the Coal Mines (Eight Hours) Bill.

In the "JOURNAL" for the 14th inst. (p. 77), we reproduced a letter which the directors of certain gas companies south of the Thames were sending to their shareholders with the view of enlisting their help in urging the local Members of Parliament to oppose the Bill introduced by the Government to restrict the working hours of coal miners. It will be seen from the following letter that the Gaslight and Coke Company are addressing their proprietors on the subject.

> Dear Sir or Madam,—The Directors of this Company consider it right to call your serious attention to the provisions of the Coal Mines (Eight Hours) Bill, which is at present awaiting second reading in the House of Commons. It is believed, and confirmatory evidence will be found in the report of the Departmental Committee appointed by the Government in 1906 to inquire into the subject, that the Bill, if passed, will, by decreasing the output, cause an increase in the price of coal, and will therefore seriously interfere with the prosperity of this Company (in common with that of all other users of coal), inasmuch as it will delay or prevent a reduction in the price of the Company's gas.
>
> As you are probably aware, this Company is enabled under its sliding-scale to meet any additional cost of coal by charging a higher price for gas. This would, however, be a very unfortunate course to adopt, because not only would it limit the consumption of gas and reduce the dividend of the proprietors, but also, and chiefly, because the extra charge would fall very heavily on the poorer classes who use gas on the automatic meter system, and who now constitute at least one-half the total number of the Company's consumers. Moreover, if the principle of restricting male labour by statue is once admitted, it would doubtless be rapidly extended to other industries, and would have a most serious effect on the trade of the country as a whole.
>
> The Directors therefore suggest, not only for the sake of this Company, in which you are interested, but also for the welfare of the country in general, that you should use what influence you possess with Members of Parliament by communicating with them and inducing them to vote against the second reading of the Bill.
>
> (Signed) CORBET WOODALL, Governor.

M. Henri Laurain, son of the Manager of the Troyes Gas-Works, has been appointed Director of the Technical Department of the Paris Gas Company, in succession to M. Euchêne, who has retired.

THE STEPNEY WORKS OF THE COMMERCIAL GAS COMPANY.

Visit of the London and Southern Junior Association.

To the East-end of London, the members of the London and Southern Junior Association wended their way last Saturday afternoon, for the purpose of inspecting the Stepney works of the Commercial Gas Company. The district and affairs of this Company always possess an interest for anyone connected with the gas industry. It is a district of London which industry and the poor can claim completely as their own. Within the Company's area is a greater expanse of docks than in the area of any other gas company; and the docks employ a large amount of labour. The factories of the district are many and varied, and also give employment to a large number of workers; and it is a district of numerous home industries. Generally speaking, too, the shops in the district are not palatial, but are just of the order to suit a dense resident population with poor or moderate means. That is the district for the supply of which with gas the Commercial Company are responsible; and it is important in such a district that there should be a good and constant service. Such there undoubtedly is. To the very boundary lines of their district, the Company have already piped; for it is hemmed in by the Gaslight and Coke Company and the West Ham Company. For business, the Company cannot therefore spread itself outwards; and its growth must be entirely of an endogenous character. Nevertheless, the Company have for many years been doing remarkably well in the expansion of their business, and in meeting the needs of the district; and despite the drawbacks that have had to be encountered, the Directors and the Engineers —from the days of Mr. Robert Jones, through those of Mr. Henry E. Jones, to those in the present of Mr. Stanley H. Jones— have pursued with zeal and success a uniform policy of cheap gas, until to-day with dear coal the price stands as low as 2s. 6d. per 1000 cubic feet. It has to be borne in mind, as the Chairman, Mr. W. G. Bradshaw, has several times brought to memory at the general meetings of the proprietors, that the Engineers of the Company have, until quite recent times, laboured under the disadvantage of capital to the par issue of which the proprietors had prescriptive rights under Act of Parliament. This being so, the Engineers in the past, with the view to ultimate economy, built the main parts of their works strongly and well; and the result has been longevity and comparatively cheap maintenance. There is economy in this, though it has a tendency to defer for a time (until plant is fairly well exhausted) an all-round adoption of the latest in style and method. In the recent changes at the works, the economist is seen as strongly as he has ever been seen in the engineering chief of this Company.

SOME GENERAL FEATURES OF THE STEPNEY WORKS.

However, we must not run too much into generalities. It was only to the Stepney works that the juniors went on Saturday; the Wapping and Poplar works not being included in the afternoon's programme. The Stepney station of the Company is the oldest of the three; it being some seventy years since gas was first made there. For coal gas, there are four retort-houses—one being a stage-floor house, with generator retort-settings, machine worked, and capable of producing on a moderate computation 2½ million cubic feet of gas per day, while the other three are still equipped with hand-worked settings, but are simply kept as reserves. Each of these three houses is equal to a production of ¾ million cubic feet; so that the daily capacity of the station for coal gas is 4¾ million cubic feet. In addition, there are two carburetted water-gas plants of the Humphreys and Glasgow type, each of a capacity of 1 million cubic feet per day.

IN THE RETORT-HOUSES—THE DE BROUWER PROJECTOR; THE LUDBROOK EJECTOR.

A glance into the old ground-floor retort-houses suffices. There is nothing special about them; but if there are two features more striking than any other, they are that, at the day these houses were built, solidity of structure was firmly believed in by the designer, as well as space, light, and head room. Looking at the buildings, there comes to memory a remark once made by Mr. H. E. Jones in the hearing of the writer as to retort-houses being built with "Roman fortitude." The phrase must have originated with him in contemplating the finished retort-houses at Stepney. The house that is the centre of interest is the only one that is at work at present; and there, in two benches, we find sixteen settings of ten retorts, 22 in. by 15 in. by 20 feet, ⊓ shape. There are three special features of interest about the house: The De Brouwer charger, the Ludbrook patent pusher, and the overhead coal-stores. The De Brouwer projector is suspended in framework, running on rails on the stage-floor, and carrying a hopper at the top which receives coal from the overhead coal-stores. There is plenty of head room in this house; and this example of the De Brouwer with its hopper looks a towering, but simple, machine. It has been in use just over two years; and Mr. Stanley Jones speaks with unqualified praise of its operation. There has been no trouble with it; and excepting for the renewal of the belt, the cost for repairs has been so small as not to be worth mention. There are two pushers in the house; and both are of the Ludbrook type. Mr. Ludbrook is

Mr. Jones's assistant at the works; and naturally there they have a liking for their own offspring. Its good features are pointed out; and they are summed up in simplicity of construction, fewness of its parts, the small demands for maintenance, and ease of working. "Have you seen anything that is simpler, or that works easier?" The question is not of that inconvenient kind that corners one when on another man's works, because this double-barrelled inquiry can with truth be frankly answered in the negative.

A Gas-Engine with a Double Purpose.

Before dealing with the overhead coal-store, we may just step through a side door from the stage, and pass down a stairway into the power room. The power for driving the machinery is electrical, and the electricity is furnished (at 220 volts) by a Lancashire dynamo, driven by a 50-horse power Grice gas-engine. In the cause of economy, the works has its own water supply; and the 50-horse power engine is not kept solely for the purpose of driving the dynamo for the intermittent working of the retort machinery. There is an air-compressor in the same room parallel with the dynamo, and worked by belting from the same shaft. Over the dynamo and the air-compressor, there are loose pulleys; so that disconnection of the dynamo or the air-compressor can be made at ease. The compressed air is used for raising, on the American air-lift principle, water from a boring; the suppliers of the compressor being Messrs. A. C. Porter and Co. This alternate working according to requirement causes the gas-engine to give an excellent account of itself from the economical standpoint. But the retort-house machinery does not depend entirely upon this set of electrical plant. In the exhauster-house, Mr. Jones had a spare steam-engine, and to it a dynamo has been connected, and so forms a useful stand-by for any emergency.

Coal Supply and the Overhead Store.

The retort-houses are all built end-on to the Regent's Canal; and *viâ* that water-way comes the coal supply for the works. The Company have four steamers of their own—three being of 700 tons and one of 1150 tons burden. To this station these vessels cannot come; so they have to be discharged into barges (carrying 60 to 80 tons each) at the Regent's Canal Docks about ¼ mile away, and these in turn are discharged by stationary or travelling cranes and grabs from a gantry running along the end of the retort-houses, and extending beyond to a vacant piece of ground used for open-air coal storage when occasion requires. In connection with the machine-worked retort-house—the only one with which we are now dealing—reference has been made to the large overhead storage for feeding the De Brouwer machine. This storage is equal to 800 tons; and on the gantry we witness the incoming of the coal and its deposit into this store. The coal as it is lifted from the barge by the crane and grab, is dropped into a hopper, at the bottom of which there is a breaker, driven by a gas-engine. Passing through the breaker, the coal falls into a lower hopper, fitted with two bottom sliding doors. Through these doors the coal is fed into side-opening trucks. Each truck with its content is weighed by a weighbridge beneath the receiving hopper, and is then wheeled on to one of two small lifts, operated—the one up to the store, the other down alternately—through belt gearing by a gas-engine. From the lifts the trucks are run along elevated rails; and through the side doors of the trucks the coal is shot into the overhead store just where wanted—the plan being to deposit the coal as near as possible to the shoots feeding the De Brouwer projector, as this saves trimming. It is a very interesting system of coal reception; and an economical one—labour, capital, and maintenance charges all being low. It just shows how situation induces variation of practice. The whole of the operations are under most perfect control; and there is little moving machinery and power required.

Coke Removal.

Turning into the basement of the retort-house for a moment, it is seen that the spent charges fall through shoots, on to a travelling screen running on overhead rails. Coke-carts (there is an excellent local trade) back in through archways in the side of the house, and receive the large coke, while the breeze falling through the screen to the floor is simply trimmed back until required.

Carburetted Water-Gas Plant.

As already mentioned, there are on the works two sets of Humphreys and Glasgow's water-gas plant, each of one million cubic feet capacity. Again, for economical reasons, and because there was the house and the space to spare, these plants have been erected in the end of one of the disused retort-houses. In connection with them, there are three Lancashire boilers, working at 100 lbs. pressure. About the generators, carburettors, blowers, &c., there is nothing special—they are all of the well-known type; and therefore do not need description. The oil-storage tank has the comfortable (for the Engineer) capacity of 360,000 gallons.

To the Gasholders.

Between the manufacturing plant and the gasholders, the plant is of quite ordinary character, and can here be passed by, until the gasholders are reached. Stepney is one of the gas storage stations; and there are here five gasholders, with an aggregate capacity of 4½ million cubic feet.

Workshops, Laboratory, Etc.

The station constitutes the headquarters of the Company. Here are the principal offices, show-rooms, rental department, and so on. On the works, too, are the fitting and other shops for both the works and the outdoor department. Introduced first to the machine shop, in it is found a variety of machine tools, driven by a gas-engine, of a class that are found serviceable nowadays on all works of any magnitude where there is machinery and iron work to keep in a state of repair and efficiency. The carpenters' and the smiths' shops are in close proximity; the last-named shop being one that is always especially busy. Filling up the spare corners and sides of the works site are found other interesting shops. A fine large shop is now being completed by the installation of new machine and hand tools for the lamp-fittings and maintenance department; and there are also stove repairing shops, and meter-stores—each department entirely separate. With about 65,000 coin meters in the district, and the stove connections increasing daily, plenty of work is found to keep the shops well occupied. The laboratory, the photometer room, and the coal-testing plant, fitted with a pair of retorts each taking a few pounds of coal, also claimed interest.

At the conclusion of the inspection, the members were conducted by Mr. Stanley H. Jones and those who had assisted him—Messrs. S. W. Ludbrook, Harris, A. H. Keldy, L. F. Tooth, and Williams—in making the visitors acquainted with the works, to the comfortable mess-rooms, where they found tea awaiting them. This part of the programme having been carried out with the active assistance of the guests,

Mr. W. J. Liberty expressed regret that a business engagement had prevented Mr. W. Upton, the President of the Association, from being present. In these circumstances, it devolved upon him to propose a hearty vote of thanks to Mr. Jones and his assistants for their kindness that afternoon in taking the members round the works, which it might be noted had a total daily capacity of about 6¾ million cubic feet. The Commercial Gas Company was incorporated in 1847, though he believed it was started in 1836. In 1875, it absorbed the old Ratcliff Company, which was incorporated in 1823. Of course, the name of Mr. Henry E. Jones would always be indelibly written over everything they had seen that afternoon; for it was his guiding hand that had brought the Company to the position it now occupied. When they considered the progress of the undertaking, it was simply marvellous, because the Commercial Gas Company were really fenced in, and had no room for expansion. There were no suburbs and green fields to which to look forward for the future building of houses. There was about 7 miles of territory, with a wall, as it were, round it; and yet the Company were able not only to hold their own, but to increase their output—in spite of boroughs that had Electric Lighting Orders. It would be remembered that it was the Commercial Company who, in 1875, were the first to take the sliding-scale (when all the other companies refused it), and thereby escaped the auction clauses, which were regarded at that time as a hardship, though now looked upon as beneficent legislation.

In seconding the proposal, Mr. W. A. Barnett remarked that personally he was very glad of the opportunity of looking round the works. One thing that it particularly pleased him to see was that the Company had adopted the method of pushing out the coke, which he was sure must be found to be a great advantage. There was no doubt that there must be an enormous difference in the wear and tear on the carbonizing plant with the newer type of machinery as compared with the old; the life of the retorts must be increased to a very considerable extent. The members were all pleased to have had the chance of seeing the works that day; and he was sure they would be delighted to have an opportunity of coming again on some future occasion.

The vote having been heartily accorded, Mr. Jones, on behalf of the Company, said they were glad to have the opportunity of showing the members of the Association round the works. As he had told them, there was really nothing in the works to boast about. They had a little modern machinery among old surroundings; but these surroundings were in a good condition generally speaking. The works were expensive, of course, compared with those on the river-side; but they did good work at the Stepney station, where he hoped they would long continue to make gas. No doubt the members saw so many modern works that it must be a pleasure to them to come to the antique. The masonry of the buildings, which were erected fifty, sixty, and more, years ago, was of a solidity which would continue to exist when modern works which had much less brickwork about them would sadly need repairing or renewing. They had at Stepney something up to date in their machinery. The pusher they had seen in operation, designed by Mr. Ludbrook, was a tremendous success. Then, with regard to the De Brouwer charger, he could not speak too highly from the point of view of wear and tear. The machine had been erected between two and three years; and he did not know of any breakdown, though, of course, they had had to renew the belting. If a machine could be produced to beat this, he would much like to see it. The discharging machine they would have noticed was in duplicate; and he thought this should be arranged in the case of all machines which had to project any part into the retort. With the De Brouwer, however, one did not want to duplicate, though spare parts might be kept.

The members then separated, highly pleased with their outing.

A GAS COMPANY'S EMERGENCY DEPARTMENT.

A recent number of the "American Gaslight Journal" contained an illustrated article, specially prepared for that publication by Mr. Oscar H. Fogg, where he describes the Emergency Department maintained by the Consolidated Gas Company of New York City. The following are some interesting particulars from the article.

The distribution system supplying gas to consumers on Manhattan Island comprises approximately 1425 miles of mains, 150,000 house services, and upwards of 600,000 meters, within an area of 22 square miles. The protection of this system, as well as the necessity of providing the most satisfactory method for giving prompt and efficient attention in cases of accident, fire, or complaint of leaks, led Mr. C. C. Simpson, the General Superintendent of Distribution, to establish a night emergency force to take charge of this branch of the Company's service throughout the night, and on Sundays and holidays, when the routine work of the distribution department was suspended. The emergency department has conclusively demonstrated its value by the work accomplished during its eight years of operation. Not only have the interests of the Company been safeguarded, but the protection which this system affords to the public is of inestimable value, providing, as it does, means of promptly rectifying, at any hour, defects in, or disarrangement of, the consumers' house piping, fittings, or appliances, over which the Company do not ordinarily exercise control.

The area supplied is divided into three districts, and at a convenient point in each is located the station of the emergency department, where, at all hours of the day and night, a crew of experienced men are on duty, with a specially constructed waggon, fully equipped with the necessary tools and implements, and with horse always in harness ready to respond at once to any call that may summon them to a point within their district. The waggons used are built with rear steps, long side boxes, and railings. The side boxes (used as seats for the crew) have hinged covers, and contain the tools forming a part of the equipment, which is a very complete one. Frequent inspection of the waggons and equipment is made, so that the helmets, lamps, &c., may be always in a serviceable condition, and also to ensure that all the required articles are being carried.

It is, of course, of the utmost importance that a complaint of leaking gas should be responded to with the greatest possible speed; for what may at one moment be merely a serious leak and be easily remedied if attended to in time, may become a disastrous explosion within an instant. On the one hand is a condition which, if promptly rectified, is without serious consequences; while, on the other, even a slight delay might result in damage to property or even loss of life, the extent of which may not be estimated. The practical efficiency of the department is, therefore, largely dependent upon the promptness with which calls are responded to. The majority of complaints of leaking gas, accident, &c., are telephoned to the Company's emergency stations by policemen, firemen, janitors, tenants, or the Company's patrolmen; the station numbers being listed in the telephone directory under the heading "Night Call in Case of Leak, No. ....." The man on duty at the telephone, immediately on receipt of a call, and before taking the details of the complaint, sounds an electric alarm, which summons the crew, who at once start from their quarters. In the meantime, the telephone man has secured the street address, written it on the ticket, and a messenger hands this ticket to the foreman as the waggon passes out of the yard. This has been accomplished within 18 seconds of the time that telephone communication was established between the station and the person reporting the leak; and at no station does this time exceed 40 seconds in the average practice. After having despatched the waggon, the telephone man notifies the person reporting the leak that the waggon is on its way; and if the leak is reported as a serious one, he cautions him against the use of lights, &c.

On leaving the yard, the waggon proceeds at once to the address given, the alarm gong usually ensuring a clear passage. Arriving there, the crew immediately locate the person making the complaint, and then determine the source of the trouble. If it proves to be an inside leak, caused by house piping, fittings, appliances, or meters, it is speedily remedied, and the crew return to their quarters—first telephoning, however, to learn if any other call has been received since their departure, so that it may be responded to direct, before they return to the station. If, however, the leak is a serious one, and coming from the street, the men at once ventilate the premises, set up their search-light, and, securing whatever street tools they may require, proceed to make an opening. While the crew are thus engaged, their waggon, the driver of which has a list of the Company's regular workmen living in the district, collects a force of these men, and brings them to the scene. They then take up the work of locating and repairing the leak; the waggon returning to the station to be in readiness for any other calls that may come in.

The men composing these emergency crews are all skilled mechanics. The first and most important rule impressed upon them is to "get there quickly;" and the efficiency of the department in this respect has been well maintained. Competitive tests are made from time to time, based upon the result of which cash prizes are awarded to the members of the crew having the highest speed average for the given period. These tests consist of trial calls, where, unknown to the men, a report of a serious leak is telephoned to one of the stations. At the instant telephone communication is had with the station, the stop-watch is snapped, and the time required for the crew to reach the address given is recorded. The distance covered is reduced to an average number of feet travelled per minute; and it is upon this basis that the award is made. The men take great interest in the efficiency of their respective crews, and there is keen rivalry in their efforts to make the best record. An emergency crew has reached the scene of a supposed accident, nearly a mile distant from their station, tools in hand and ready to work, within 3 min. 49 sec. of the time the telephone bell rang, travelling the distance at an average rate of 1318 feet per minute. This is not an exceptional performance, but is indicative of the general standard maintained throughout the department, not only in these special or test calls, but in actual emergency work.

One case—typical of many—which illustrates this latter point may be cited. From a large apartment house, in a residential section of the city, a report of a serious leak was telephoned to one of the emergency stations in the morning hours (2.40 a.m.). This point was at a distance of 1·23 miles from the station; and when the crew arrived upon the ground they found the house full of gas and the occupants in a state of panic. In 10 minutes from the time this call had been received at the station, the service-valve was closed, the building ventilated, and the possibility of an explosion averted. Subsequent investigation proved the leak to have been due to the fusing of the service-pipe by grounded current; the defective insulation of an outside wire resulting in contact of the conductor and a metal awning-post, close to the base of which lay the service-pipe. The escaping gas followed the service into the basement, and thence through the building.

By far the greater number of calls to which the emergency department responds are those caused by accident to, or disarrangement of, the consumers' house piping, fittings, or appliances. Falling chandeliers, broken brackets, and leaking house-pipes form the majority of this class of complaint. The Company do not ordinarily exercise control over this private property; but such calls are always immediately responded to and the leaks remedied. The consumer is thus afforded prompt relief from a condition which, if allowed to go without attention until morning, would cause inconvenience, if no more serious result.

Frequently the crews are summoned on fire calls by the City Fire Department; their duty in such cases usually being to shut off the gas supply to burning buildings. In order that the firemen and policemen may readily call out the crews in any emergency, gummed labels are supplied to them, to be pasted in the helmet or cap, which enumerate the several emergency districts, with the station locations and telephone numbers. An outline map of the city giving this information is also supplied to the police and fire stations. In addition to the emergency stations shown upon the map, several sub-stations are maintained in the more congested districts. These sub-station crews, however, do not receive complaints direct, but are despatched by the district office in cases where they may more promptly reach the point than could the station crew. In cases of extreme need, the entire emergency force on duty throughout the city could be quickly assembled at any point; and this force would be constantly added to as the waggons collected the regular workmen and brought them to the scene. Fortunately, such a contingency seldom arises; the work within the several districts usually being so distributed that it may be satisfactorily handled in the routine manner described.

For work of this nature, much of which must be performed at night, efficient and safe means of illumination has to be provided. The search-light already referred to consists of an acetylene lamp and generator, with box and tripod. The lamp is mounted upon a pivot, so that its light may be thrown upon any desired point. It is employed principally in street work, and is set up at a safe distance from leak or opening. For inside work, hand battery electric lamps are used, or the incandescent hand lamps connected to the large battery by extension cords. These are also of value in manhole work, or where, owing to lack of space, the hand battery lamp may not be so conveniently used. The safety helmet has proved useful in cases where the men are required to enter vaults or cellars where gas is escaping in large quantities. It consists of a rubber headpiece, a compressed-air tank, gauge, and valves. The headpiece is lined inside with wool pads for the purpose of absorbing the moisture of the breath. A woollen collar is adjusted to fit the neck of the wearer snugly, and the flow of air from the tank to the headpiece is regulated by a needle valve. So equipped, the workman may remain in a gas-filled room for from 30 to 45 minutes without discomfort. The helmets may also be used to advantage in deep trenches where gas is escaping, under planking, or in similar places where it would be otherwise unsafe to venture.

During the past year, the emergency department responded to 1349 night calls. Minor accidents, asphyxiations, &c., may not be wholly eliminated in a system of such magnitude, with more than 600,000 meters in use, each one supplying its own more or less complicated network of house piping. But Mr. Fogg states that since the department was established, not one serious explosion due to illuminating gas has occurred within the 22 square miles of congested city area supplied by the Company; nor, in fact, have even minor accidents happened resulting from escaping gas, save in the few cases where failure to promptly notify the Company made it impossible to apply the customary precautions.

INSTITUTION OF CIVIL ENGINEERS.

The New Premises—Increased Entrance and Transfer Fees.

To authorize the sale to the Government of the present premises of the Institution of Civil Engineers, as recently referred to in the "JOURNAL," a special general meeting was recently held, and 241 members were present. The President (Sir William Matthews) referred to the three years' confidential negotiations that had been going on between the Council and the Government Office of Works. The first site suggested for the new premises was opposite to the existing building; but, though admirable, and facing Parliament Square, the area was not sufficient. Neither was a portion of the Stationery Office suitable, nor sites in Parliament Street or Birdcage Walk. So the site decided upon in Great George Street was the accepted one. The proposed great hall would serve for special gatherings, examinations, and engineering conferences. Sir William White further explained the position of affairs. The area of the new site is about 17,000 square feet, against 10,700 square feet which is the area of the present premises. The Government are to pay £40,000 in cash for the latter, and also give an option to purchase No. 6, Great George Street, at £14,400. The final adjustment of payments will be at the rate of £8 5s. per square foot. The new premises can be built to a height of 70 feet; and about two years are allowed for their erection. Improvements will be made in the reading-room, the conversation-room, and the library. The resolution empowering the Council to enter into the agreement for sale, was, after some discussion (amendments being proposed), carried with two dissentients.

Sir John Wolfe-Barry proposed the resolution increasing the members' entrance fee to twenty guineas, and the transfer fee from associate membership to full membership to ten guineas. He said he was in the position of the Chancellor of the Exchequer when he brings in a Budget to add something to the income-tax. The Institution would receive from the Government, in value of land and money, £93,000. The present building cost £62,000, and it was proposed to spend about £110,000 on the new premises. Provision for £85,000 had to be faced; and a net £1000 a year more revenue would be required to meet the new conditions. After a discussion on a proposal to adjourn, the resolution was carried with eight dissentients.

The Institution of Civil Engineers is now, therefore, authorized to embark on the work of building a new and larger home of engineering.

WEATHERING AND DETERIORATION OF COAL.

The authorities at the Engineering Experiment Station of the University of Illinois have issued the results of experiments which have been carried out in connection with the weathering and deterioration of coal. The following is a summary, taken from the "Iron and Coal Trades Review," of the studies made by Professor S. W. Parr and Mr. N. D. Hamilton: (*a*) Submerged coal does not lose appreciably in heating value. (*b*) Outdoor exposure results in a loss of heating value varying from 2 to 10 per cent. (*c*) Dry storage has no advantage over storage in the open except with high-sulphur coals, where the disintegrating effect of sulphur in the process of oxidation facilitates the escape of hydrocarbons or the oxidation of them. (*d*) In most cases the losses in storage appear to be practically complete at the end of five months. From the seventh to the ninth month the loss is inappreciable. (*e*) The results obtained in small samples are to be considered as an index of the changes affecting large masses in kind rather than in degree; but since the losses here shown are not beyond what seems to conform in a general way to the experience of users of coal from large storage heaps, it may not be without value as an indication of weathering effects in actual practice.

Professor Parr has also investigated the matter in collaboration with Mr. W. F. Wheeler, with the following results: (*a*) An exudation of combustible gases from coal will occur from the time of breaking out the sample from the vein. (*b*) An absorption of oxygen accompanies the exudation of hydrocarbons. (*c*) Samples of coal in most carefully sealed containers are subject to deterioration. (*d*) The process of deterioration is probably due to oxidation of hydrogen or hydrocarbons by means of the absorbed oxygen. It may also be due to a simple loss of combustible gases and their replacement by non-combustible gases, such as oxygen. (*e*) The rapidity or the extent of this deterioration varies with different coals; it is probably most active during the first two or three weeks from the taking of the sample, but does not seem to reach a normal state till after a few months have elapsed.

Mr. Joseph Smethurst, the Chairman of the Great Grimsby Gas Company, whose somewhat sudden death was recorded in the "JOURNAL" for the 24th ult., left £50,622.

Mr. Hurdman Wilkinson, younger son of Mr. Harry Wilkinson, the Secretary and General Manager of the Harrogate Gas Company, and President of the North of England Gas Managers' Association, was married on the 18th inst., at Bowden, to Miss Margaret Mary Judge, the eldest daughter of the late Mr. W. P. Judge, of Market Harborough.

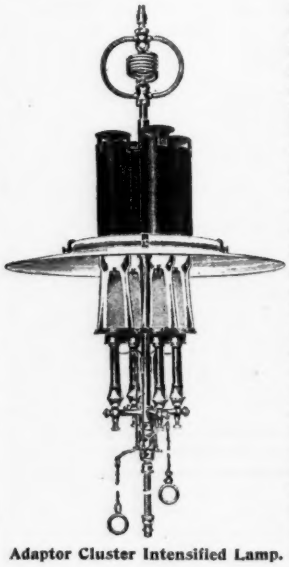
IGNITION OF RAILWAY CARRIAGE LAMPS.

Readers are aware that the lighting of railway carriages in France has been greatly improved of late years; various systems having been successively tried, and the latest improvements adopted. As incandescent gas is employed by several of the Railway Companies, some device had to be found for the instantaneous ignition of the lamps. MM. Biard and Maucière, the Engineers of the Eastern of France Railway, lately described, in the "Revue Générale des Chemins de Fer," the different experiments made. The first process was tried about five years ago, and consisted in the use of a piece of spongy platinum, fixed over the burner, ignited by incandescence of the metal in contact with the gas and air. The arrangement, however, was not satisfactory, and had to be abandoned. Platinum, like all catalyzing agents, gradually loses its properties; and its efficiency is weakened by humidity and dust. The electric process, with sparks produced by means of a Ruhmkorff coil and a battery of accumulators, yielded unsatisfactory results, owing to the defective insulation of the secondary circuit. A low-voltage current from the accumulators was then substituted for the high-voltage coil current; it being conveyed to a platinum wire, which ignited the gas by incandescence. Owing, however, to the varying charges of the accumulators, the incandescence was variable. Moreover, the transport of the accumulators and their maintenance constituted quite as great a source of inconvenience as the electric lighting employed for many of the carriages.

The arrangement which gave the best result consists in replacing the accumulators by a magneto-electric appliance, similar to that employed for motor-cars, which can be worked by an employee from outside the carriage by the aid of a crank. The current is conveyed to a primary coil surrounded by an induction coil connected with a nickel-wire ignition device fixed above the flash-light of the Welsbach burner. Three lamps are connected in series, each having a transformer; and the secondary circuit of a single Ruhmkorff coil is avoided. To enable the same electric appliance to simultaneously ignite the flash-lights of 15 lamps, a distributer, worked by the crank of the magneto, conveys current into five circuits, each comprising three lamps. An ingenious device has also been adopted to clear the gas-pipes of air at the moment of ignition. If the pipes are full of air, there will, of course, be no ignition, and a mixture of air and gas will cause slight explosions. It is stated that the adoption of this system of ignition will result in considerable economy of gas and time. In the fast trains running between Paris and Bâle, the carriages of which are lighted for 4½ hours in tunnels, the estimated saving on each carriage is 223 frs. (roughly £9) per annum.

TWO NEW LAMPS.

Travelling about one often sees splendid types of large outside lanterns, which cost money to build, which have an everlasting appearance, and in which flat-flame burners still hold sway or in which the ordinary incandescent burner has been placed Those lanterns are very suitable for something better—for, in fact, high-power gas-lighting. To this particular class of work Messrs. A. E. Podmore and Co., of Charles Street, Hatton Garden, have been turning their attention; and they have developed for this special purpose what they call their "Adaptor" four-burner intensified combination. The first was made for the Padiham District Council, and was fitted in a hexagon lamp. The adapting combinations are made in two sizes, both with four burners—the one to give a total light of 600-candle power, and the other a light of 960 candles, consuming respectively 5 cubic feet per burner an hour (20 feet per lamp) and 8 cubic feet per burner (32 feet per lamp). The light from inspected sample lamps was very intense and penetrating. The burners used in the adapting combination are made so that every part is detachable by simply sliding apart; and all parts are interchangeable, so that the efficiency of the burners can be permanently maintained at a very small outlay. The burners are also fitted with the firm's draught-proof glass holder, in order to prevent any oscillation of the flames and mantles; thus keeping the lights steady, and preventing the mantles fraying out by swaying on their supports. The glasses surrounding the mantles are of the firm's special shape (something like hyacinth glasses), wide at the base and narrowing to about level with the top of the mantle, and then expanding again to one diameter for



Adaptor Cluster Intensified Lamp.

the remaining length at the top; where each glass connects up to a metal chimney above the reflector. The glass and chimney in combination (forming as it were a little shaft) produce a sharp current of air upwards, and assist in increasing the incandescence of the mantle. Arrangement is also made for the heating of the primary air supply. One small but interesting feature is that the glasses can be lifted up, and supported in the metal chimney without removal, if a mantle merely requires attention. This is accomplished by a flat spring (on the outside of the metal chimney), carrying a stud at the bottom, which passes through a slot in the chimney; the result being that, when the glass is pushed up the chimney, the stud holds it in safety by the shoulder formed in the glass by the shaping in the manner already described. The gas supply can be connected either at the top or at the bottom of the lantern; and each burner is furnished with bye-pass, lever, and chains. The whole combination is carried by an anti-vibrator. The requirements for the conversion of existing large lanterns to a high-power incandescent system have been well thought out, and give a very practical and efficient combination for the purpose.

Another new production of the firm is the "Prince" two-light inverted lamp; and it is a very neat and attractive piece of work. It is, in effect, a modification in small size of the firm's well-known three-burner inverted lamp on the recuperative principle, with similar adjustment for each burner. In the first place, it is noticed that the burners are of the angle type, and that the inlets for the primary air supply are outside the casing of the lamp. There is thus no possibility of the products of combustion having any deteriorating influence on the combustible mixture. Convenience of regulation is another feature. The means for adjusting both

The "Prince" Two-Light Inverted.

the air and the gas supply are outside the lamp, and so are kept cool, and can be manipulated at any time and in any place, according to the demands of quality and pressure. A hinged frame, which is locked in position by a thumb-screw, supports the globe, which simply rests in the frame, and therefore is not subject to the danger of being too tightly screwed in position by careless attendants. The secondary air supply is taken in around the rim of the top, so that there are no holes in the glass. The metal head is finished in various styles—oxidized copper, nickel silver, and polished brass; and, with the decorated globe, it presents a handsome appearance. The light-giving power of the lamp is excellent.

Automatic Fire-Extinction in Factories.—At a recent meeting of the Junior Institution of Engineers, a paper on "Automatic Fire Extinction as Applied to Factories" was read by Mr. G. T. Bullock (the Vice-Chairman), the Chief Surveyor to the Union Assurance Society. The history of the subject was first lightly touched upon, and then reference was made to various types of sprinklers. The essential conditions of a successful installation were fully described, and the points of buildings where special protection was needed were enumerated. Questions relating to water supplies were discussed, including town mains, elevated gravity tanks, private reservoirs, pressure-tanks, pumps, and automatic injector apparatus. Supply areas and distributing-pipes, valve connections, pressure and alarm gong, and other important branches of the subject, were treated; and, in conclusion, the author gave some valuable statistics showing the effect of automatic fire-extinguishing apparatus in actual operation. The paper was illustrated, and a number of specimens of sprinklers were exhibited. It gave rise to an animated discussion, at the close of which a vote of thanks was passed to the author.

AMERICAN VIEWS ON RETORT-HOUSE PRACTICE.

At the last Annual Meeting of the Illinois Gas Association, a paper was read by Mr. W. E. Hartman, of Aurora, in which he set forth his views on retort-house practice. They will be found in the following extracts from his communication.

Retort-house practice of to-day is distinctly different from that of twenty-five years ago, and probably just as widely different from that of twenty-five years hence. A quarter-of-a-century ago, small, direct-fired settings of three to six retorts run at relatively low carbonizing temperatures, were in general use. The temperatures being low, there were no such difficulties as we have to contend with to-day—viz., the production of lampblack and naphthalene. Fuel results were not a point to be considered, because the market for coke had not been developed. So at that time there was no demand for the saving in bench-fuel which has now been accomplished by the adoption of recuperative benches. Looking ahead a quarter-of-a-century, it is no idle dream to foresee a marked and radical change in retort-house methods.

Retort-house practice is passing through a transition period. The foremost engineers have come to a realization of the weakness of our carbonizing methods from a scientific standpoint. Studying the thermo-chemical reactions in a retort, they appreciate the crudeness of a process which involves the destruction of some of the most valuable constituents of the principal product. They realize the need of improvement, and they will welcome a more scientific method of carbonization. The vertical retort appears to solve the problem by offering a carbonizing vessel in which the gas as evolved is not destructively overheated, and consequently retains the hydrocarbons, which in the horizontal retort are partially decomposed to form lampblack and naphthalene. The progress made in the development of vertical retort construction is certainly gratifying. We read of the Woodall-Duckham vertical retorts, which are operated continuously, being automatically charged and discharged. Let us imagine, if we can, a retort-house without any of the smoke or dirt with which we are now familiar in that part of our plant; and besides that, the production of better gas, better tar, 50 per cent. more ammonia, and no lampblack or naphthalene. From our present point of view, such a picture certainly partakes of the ideal in retort-house practice. But we are now concerned with the present retort-house practice, and that in Illinois more particularly. With this in view, the writer will restrict the subject to a treatment of hand-operated, horizontal retort-settings, and more especially recuperative settings.

Foundations.—Our bench foundations must be of the best. In some cases this is a simple matter; in others the conditions may warrant extreme measures, such as driving piles. But however difficult this phase of the construction work may be, it should not be neglected. If the foundation is unstable, cracks will result in arches and in flues, with detriment to bench-results.

Style and Size of Setting.—It has been clearly demonstrated that recuperation pays, and pays in proportion to the amount of recuperation; in other words, that the fuel economy accomplished by recuperation more than offsets the difference in first cost between direct-fired settings and gaseous-fired settings. Special local conditions in retort-houses have been the cause of the installation of half-depth benches with pits in front. Their operation has proved them to be not altogether desirable. As a full-depth setting for hand operation, a setting of nine retorts offers many advantages over one of six, as the larger setting economizes floor space, labour, and furnace fuel. A full-depth bench of sixes will require from 2 lbs. to 3 lbs. more fuel per 100 lbs. of coal carbonized than a full-depth bench of nines. The middle bottom retort in a setting of nines has been of short life in some styles of settings; but the writer has experienced no such difficulty, and has had settings of nines in continuous operation for more than 48 months up to date, each retort generating 11,000 cubic feet of gas per day.

Size of Retorts.—Progress with vertical retorts has shown that space above the charge in a horizontal retort is not needed either for the passage of the gas or for the swelling of the charge during the coking process. It has been found that a retort may be charged full of coal without any injurious swelling of the charge; the gas travelling out through the centre. With this in mind, we realize that the only reason for space above a charge in a horizontal hand-operated retort is the need of rake-room in drawing; and this space should be no larger than is necessary for this purpose. It is this open space which is at the root of our carbonization evils—space through which the gas travels exposed to the heat of the bare top and side walls of the retort. It is here that our valuable illuminating hydrocarbons are decomposed into hydrogen and free carbon; this free carbon manifesting itself in stand-pipe and hydraulic main stoppages, and in the production of a poor grade of tar. Here also naphthalene is formed as a decomposition product of benzene. So it behoves us to avoid as much of this open space as possible. If conditions demand small charges, the retorts should be correspondingly small, so that the charges will nearly fill the retorts; leaving only room for the rake. It is manifestly poor practice to put small charges in large retorts. The writer has found it advisable to charge from 380 lbs. to 400 lbs.; the retort measuring 16 in. by 28 in. by 9 ft. In a recuperative setting, particularly a full-depth one, this weight of charge can be carbonized in four hours,

yielding 5 cubic feet per pound from Pittsburg coal, without any danger of running too close to the refractory limit of good bench material.

Bench Material and Ironwork.—Bench material is not all alike in quality. Retorts and bricks of one make may differ widely in durability from those of another make; and there may be a difference in refractory qualities and in heat conductivity. Again, some grades of bricks may lack uniformity of size and shape, so that it is impossible to lay them without some of the fire-clay joints being too thick for good fire-brick mason work. The proper location of the charging-door of the furnace is important. It should be so placed that hot coke may be dumped into the fire without shovelling, and so that a full level fire can be maintained without it being necessary to push back the bulk of the fuel. As it is advisable to have the firing-door open as short a time as possible, we certainly should not be obliged to shovel the fuel in, and then laboriously push it back in the furnace. Stand-pipes should be at least 7 inches in diameter—8 inches is preferable. Steel pipes have been substituted for cast iron, and have proved satisfactory because of their lightness and their durability.

Hydraulic Main and Accessories.—The hydraulic main should be easily accessible for cleaning, and should be fitted with a proper tar and a liquor off-take. The usual arrangement bolted on to the end of a hydraulic, and designated as an automatic adjustable tar and liquor off-take, has no excuse for existence in a retort-house. I refer to the common arrangement by which the tar and liquor are supposed to pass out through an opening at the bottom of a partition, and then run off through an overflow; this point being adjustable. The tar and the liquor should have separate outlets from the main; and any attempt to pass them out regularly and together in the above manner will result in irregularity of the seal on the dip-pipes. The difference in specific gravity between the tar and liquor is so great that they will not run away together under these conditions. Regularity of dip-pipe seal is vital to successful operation. The seal should be deep enough to avoid drawing air when mouthpieces are open. Only 0·1 inch would accomplish this if the water in the hydraulic main were quiet, and did not suffer any fluctuation due to the bubbling of the gas out of the dip-pipes, and if our exhausters were so nicely governed that there could be no variations in the vacuum. To be safe, it is necessary to carry a heavier seal, say, half-an-inch to an inch. But the seal should be no deeper than is necessary for safety. If the seal is excessive, this excessive pressure in the retorts has a deleterious effect upon the hydrocarbon in the gas, more lampblack is formed, and more stopped stand-pipe troubles are experienced; and the same condition is favourable to naphthalene formation.

If the hydraulic main is equipped with an off-take which ensures an irregularity of seal, the variations running as high as 1 inch to 1½ inches, it is evident that, in order to avoid drawing air, the average seal during these variations must be much deeper than if we have a proper off-take. In this connection, the writer has had very satisfactory experience for the last three years with a tar-displacement arrangement. The hydraulic main is fitted with an adjustable liquor surface overflow; and the main has at the bottom a 6-inch connection to a tank at a lower level. At the start, this tank is full of water or ammoniacal liquor. A valve is opened on the 6-inch connecting-pipe, and the tar, as deposited in the main, slowly flows down into the tank, the water in which is displaced and flows up through the same 6-inch pipe into the main. Periodically this tank is shut off, and the tar run out through a connection to the tar-well, after which it is filled with water and put in action again by opening the 6-inch valve. But instead of using fresh water to fill the tank each time, the liquor overflow from the hydraulic main may be used. In this case, it is necessary to instal a liquor-tank at a higher level than the tar-displacement tank, to receive the overflow from the hydraulic main. By the use of this arrangement, a hydraulic main serving 75 retorts, which has been under the writer's care, has been kept practically free from accumulations of tar. It has not been necessary to clean it out oftener than once in four months; and not more than a barrel of heavy tar lumps from the whole main has been obtained.

Erecting Ironwork.—When attaching mouthpieces, the nuts should be drawn up on the bolts with the fingers only. If the bolts are tightened with a wrench, there is danger of breaking the retort. Usually a rust-joint cement is employed on mouthpiece flanges. The following mixture makes a good cement: One part by weight of fine cast-iron borings, and three parts by weight of fire-clay. Mix with strong ammoniacal liquor or with a saturated solution of sal ammoniac in water. In erecting stand-pipes, the spigots should be centred in the sockets, allowing at least half-an-inch space in one of the sockets of each pipe from the end of the spigot to the bottom. If these joints are made up iron-to-iron, the expansion of the pipes when heated up may be sufficient to break the mouthpiece off the retort. It is not advisable to use rust-joint cement in stand-pipe joints, as it is difficult to remove when taking down pipes to renew retorts. The writer has found that slaked lime makes a tight joint and is easily removed when necessary. It is advisable to leave one joint on each pipe, to be made-up after the setting and ironwork have been heated up, or just before the retorts are in charging condition. When a bench is shut down for any reason, the stand-pipes should be shut off from the hydraulic main. An important detail of ironwork erection is the levelling of the hydraulic main to ensure equality of seals on all dip-pipes.

Drying Out.—The moisture occluded in the pores of retorts and fire-bricks must be driven out gradually, to avoid damage to the material. If a setting made up of damp moisture-laden material is brought up to a high temperature suddenly, the formation of steam in the pores of the material will be so rapid that it cannot escape without causing injury. It is highly important, therefore, that care be exercised in regard to the drying-out period. Before starting the fire, there should be water in the ashpan, all dampers and air-slides should be tightly closed, the clinkering-door wide open, and all stoppers out on the face of the bench between and round the retorts. A coke fire should be carried about 12 inches deep throughout the length of the grates. The clinkering-door being wide open, a large volume of slightly warmed air rises slowly through the furnace, round the lower retorts, and out through the lower stopper-holes at the face of the bench. If this warm air were led out through the water-gas flues and the stack, the moisture picked up from the furnace walls and setting would be deposited by condensation in the cold flues. This low fire should be uniformly maintained for about two weeks. It is advisable always to feed hot coke into the fire, or if cold coke must be used, the fire should never be entirely covered with cold fuel. This precaution should be observed until the bench is under full fire, and the setting itself is hot enough to ignite the mixture of carbon monoxide and air above the fuel. Neglect of this precaution may cause damage to the setting by explosion. After three days the lower stoppers may be inserted, thus causing the warm air to travel higher in the setting to escape through the upper stopper-holes. After a week the remaining holes may be closed and the stack dampers opened slightly, so that warm air is drawn through the flues up the stack, drying out the recuperators.

Heating Up.—At the end of two weeks, the moisture should have been thoroughly driven out, and the bench may be brought up to a working heat by gradually increasing the amount of fire; keeping the clinkering-door ajar now, and also supplying air through the primary air-slides, which are opened only slightly. After three or four days of this heating-up period, the clinkering-door may be closed and the primary air-ports and dampers opened wider. When the combustion chamber shows a good red heat, secondary air may be admitted, and the bench brought up to working temperature as soon as possible—the retorts being charged when they reach a good red heat.

Shutting Down.—To let down a setting, all openings should be closed and the bench thoroughly sealed up with clay at all crevices round the doors or stoppers. The dampers should be left only slightly open. Closing up the bench in this way will ensure gradual cooling without injury from a too rapid contraction of the material. After the gas has been driven out of the charges left in the retorts, the stand-pipes should be closed off from the hydraulic main.

Adjustment of Air-Slides and Dampers.—The primary air-slides are the openings through which the fire receives all the air for the combustion of the solid fuel and the production of producer gas. The retorts are heated by the burning of this producer gas as it unites with secondary air introduced above the furnace arch of the producer. To increase the heat of a setting, we introduce more primary air; thus burning more fuel and generating more producer gas. In order to burn this additional amount of producer gas, it is necessary to correspondingly increase the supply of secondary air. The combustible constituent of the producer gas is carbon monoxide, which burns with a blue flame; and we may take advantage of this fact in adjusting our secondary air openings. If there is not enough secondary air entering the combustion chamber to burn up all the producer gas, we shall find this carbon monoxide in the waste-gas flues, and on opening a stopper sight-hole it may be seen burning with its characteristic blue flame. The stack damper should be opened only enough to draw in the right amount of primary and secondary air. If possible to do it, and still retain the proper heat on the setting, the dampers should be checked so that back-pressure is shown at the middle sight-hole. Such checking will result in decided fuel economy. If there is too much draught, the hot products of combustion are carried out of the setting to heat the stack and the surrounding atmosphere. After the air-slides and dampers have been once properly adjusted, it should not be necessary to frequently alter them if the operating conditions are unchanged. It is sometimes found that one end of the bench runs considerably hotter than the other. This may be remedied by closing one or more of the furnace-arch openings at the hot end by means of a tile inserted through a stopper-hole.

Firing the Furnace.—If coke is used as bench-fuel, there is a decided advantage in feeding it hot as drawn from the retort. By so doing we not only economize fuel but prolong the life of the bench, as we avoid the chilling effect of cold fuel. The furnace should be fired at least every two hours—thus ensuring the advantages of a deep fire; and the fire should be pushed back to keep the fire-bed level. This will avoid short-circuiting of air and irregular heating of the different parts of the setting. Water or steam is used in the ashpans to keep the temperature of the ash of the fuel below the fusing or clinkering point. This temperature varies for different fuels, depending on the proportions of fusible constituents in the ash. The writer favours the use of water rather than steam, as the quantity can be more easily regulated. The supply of water should be visible without opening the clinkering-door. A constant stream is supplied to the drip-plates and thence to the ashpan, where it is evaporated. The resultant steam keeps the ashes cool, and is then decom-

posed into hydrogen and oxygen by the hot coke, from which heat is absorbed in the process. In the combustion chamber this hydrogen unites with oxygen and burns to form water vapour again, giving out an amount of heat equal to that absorbed in the decomposition of the water vapour down in the fire. The use of water or steam is not unattended with an ultimate loss of heat, this loss being explained by the difference between the temperature of the water or steam admitted in the ashpan and that of the escaping stack gases. For this reason, an excess of steam is to be avoided.

Cleaning Fires.—With a coke fire, using coke from Pennsylvania coal, the clinkers should be thoroughly removed with the aid of supplementary bars every three or four days. With a coal fire, using the same coal, once a week is sufficient. Just before cleaning the fire, the fire-box should be filled, and the clinkering done entirely through the door. A deep fire is particularly desirable at this time, to avoid excessive cooling of the setting by the entrance of a large volume of cold air through the open door. The supplementary bars are driven in quite close together above the top water-plate until their ends rest upon the brick ledge at the back of the fire-box. They serve to hold up the coke above this point, permitting the thorough cleaning out of the clinkers and ashes below, after which the bars are withdrawn. The cleaning is facilitated by the temporary removal of the grate-bars. As the work should be done as quickly as possible, it is advisable to arrange to have two men at work together on each fire. In addition to this thorough cleaning out of all clinkers and ashes, the fire should receive further attention every six hours. At these times a light bar should be driven through the fire and along the furnace walls, loosening up any clinker formation, and incidentally forcing the ashes down into the ashpan, which should be kept clean to facilitate the evaporation of water. By the foregoing method of furnace treatment, at the end of four years' operation the furnace linings of benches under the writer's observation have been found eaten into a distance of only 4½ inches.

Charging Retorts and Quenching Coke.—A fixed size of charge should be adopted to conform to the size of the retorts, and it should be adhered to; the heat on the setting being maintained by proper attention to the furnace and flues. All the coal should be weighed on scales of which the accuracy is frequently tested. It is advisable to paint on the charging-waggons the desired gross weight of the load; thus facilitating accurate fillings. If the coke is quenched by means of a spray or hose, a large excess of water should be guarded against. Water-soaked coke is not easily marketable. For this reason the writer favours the use of buckets, unless spraying can be done by some method that restricts the quantity of water to the amount actually needed.

Decarbonizing.—At regular intervals of from eight to ten weeks, each retort should be decarbonized. This is done by burning loose the deposits of hard carbon which have accumulated by the decomposition of the hydrocarbons in the gas and tar. There are various methods of decarbonizing. The old way was that of laying a line of half-round tile along the bottom of the retort, and bricking up the rest of the mouthpiece opening, allowing natural draught to circulate through the tile and return through the retort and up the stand-pipe. This method is slow, and often allows the retort to get dangerously hot. It has been superseded by more rapid methods, most of which work less injury to the retorts. The use of compressed air gives very good results. A common plan is that of using a steam-jet blowing into the open end of a 5-inch or 6-inch steel pipe laid in the retort—the forced draught facilitating the process. This method has been improved by the addition of a small pipe-coil lying in the retort, through which the steam first passes and is superheated; thus ensuring the use of dry steam, as well as economizing it. By these methods, four hours should suffice for decarbonizing a retort, if it is comparatively new. When the carbon is sufficiently loosened, so that it may be removed quite easily, the retort is ready for patching.

Patching.—To properly patch retorts without letting-down the bench often calls for considerable skill. A hole may be covered with a tile and fire-clay plastered round it; but this is not good practice, as it leaves an objectionable obstruction in the retort. A better plan is to fill the hole with a good grade of cement, and make the patch conform to the regular shape and size of the inside of the retort. A large hole in the top may be patched from the outside; backing-up with a bar on the inside. Holes of any size may be smoothly patched by this method. The writer recalls an experience with one measuring 18 in. by 24 in., running up the side and partly across the top of the retort. A piece of heavy sheet iron, bent to the shape of the inside of the retort, was used as a form on which the cement was plastered, working through an opening in the wall outside the retort until the hole was filled. The sheet iron was withdrawn after the cement had had sufficient time to set. After patching a retort, the furnace arch should be examined for pieces of retort or patching material. If this has been neglected, it is sometimes necessary to use a bar and sledge to loosen-up such material. It is important that the furnace-arch nostrils and secondary air openings should be kept clear. If after decarbonizing the retort is charged with coal, a large part of the gas from this first charge will be lost through the innumerable small cracks. Consequently, the writer favours the practice of first charging a mixture of coal tar and coke breeze, in order to carbon-up the cracks and so prevent leakage in the subsequent charges of coal.

Clearing Stand-Pipes.—No other work is more disagreeable and exhausting than that of clearing stopped pipes; and the necessity for such work should be minimized. If the carbonizing conditions are favourable for the production of lampblack—if for any reason the gas does not quickly leave the retort, and suffers undue exposure to its hot walls—trouble may be expected. Lampblack when formed adheres to the tar-coated stand-pipe, and accumulates along with more tar, gradually closing up the passage. Large stand-pipes are a partial remedy, as they act as better condensers for the lighter tar; thus keeping the inside of the pipe washed down, as it were, with tar. Steel pipes are more efficient in this particular than heavy cast-iron pipes. Palliative remedies for stopped pipes have been used with more or less success; but a small stream of water running down the inside of the pipes will better condense the tar, and help to keep them clear. The writer visited one plant where it was the practice to place in the iron mouthpiece, just before closing up, a large lump of cannel coal, the light tar from which helped to keep the pipes clear. Gas-works mechanics have taxed their ingenuity in the construction of efficient pipe reamers, to cut out this hard deposit; but it seems that we are shooting wide of the mark when we neglect the primary cause of the trouble. If our carbonizing conditions are such that an excessive and troublesome quantity of lamp-black is formed, it is wise to improve them. In one plant with which the writer was connected, where long through retorts were in use, lamp-black trouble was overcome by building up a wall in each retort, making them one-half as long. In another case, the remedy was found in increasing the bulk of the charge, correspondingly raising the heat of the setting. A deep, irregular seal on the dip-pipes has been decidedly improved by the installation of a separate tar and liquor outlet on the hydraulic main.

Cleaning the Hydraulic Main.—Hydraulic main stoppages are usually concurrent with stand-pipe stoppages, and have the same origin. Lamp-black deposits with the tar, and forms a substance too thick and viscous to flow away; but by the use of steam-jets along the bottom of the main, the fluidity of this heavy tar and lamp-black mixture may sometimes be increased. By pumping a stream of ammoniacal liquor continuously through the main, circulation may be promoted, and thus a part of the lamp-black be discharged before it has time to settle down and mix with the tar. But the writer has seen carbonizing conditions so bad that these remedies failed to overcome the difficulties; and to arrive at their proper solution, we must realize the cause of any excessive production of lamp-black, and change any incorrect carbonizing conditions. In other words, we must avoid excessive overheating of the gas in the retort. This cannot be entirely avoided in a horizontal or an inclined retort, or (however large the charge or short the retort) in the modern vertical retort; but the nearer we approach vertical retort practice in this particular—the treatment of the gas in the retort—the more surely shall we avoid the excessive formation of lamp-black, with its resultant obstruction of the stand-pipe and the hydraulic main, as well as the production of naphthalene. This substance presents a problem in carbonization. We may devise any number of methods of condensation or of scrubbing to handle it after its formation, but it originates in the retort; and it is only by changing the conditions in the retort itself that we shall be able to prevent its formation, and retain in the gas the valuable illuminant from which it is produced.

LARGE GAS-ENGINES.

On the 20th of last month, before the French Society of Civil Engineers, a paper on the subject of "Gas-Engines of High Power" was read by M. Letombe.

He pointed out that the progress made in gas-engines had been very great and rapid. In 1878, it seemed hazardous to build an engine of 15 H.P.; to-day an engine of 3000 H.P. could be made; and the future would no doubt see even more powerful ones. To the late M. Delamare was due the construction of the first large gas-engine. In 1889, he made one of 100 H.P.; and in 1900, one of 600 H.P. was built by the Cockerill Company, and was shown at the Paris Exhibition. It had a single cylinder, and its piston, which was 1·300 m. (4 ft. 3¼ in.) in diameter, was the largest up to the present. The single-acting engine is now never adopted for large sizes, on the ground of net cost and steadiness. Four-cylinder engines were in favour.

Two systems of regulating had been adopted—qualitative and quantitative. Theoretically, the former, which consists in impoverishing the explosive mixture, ought to be the better; but, in practice, it is not so, owing to diagrammatic deformations which unfavourably influence the heat efficiency of the engine. M. Letombe has partly overcome this difficulty by further compression above 8 atmospheres. It is not, however, advisable to go beyond 12 or 13 atmospheres. Practically, quantitative regulation—that is, variable admission of a constant mixture—gives the most economical results; for although the compressions are reduced, the expansion remains the same, and the efficiency varies very little.

M. Letombe described the arrangement he has used on one of his 1000 H.P. compound engines in order to effect actual constancy in the mixture admitted. He has thus been able to get a horse-power-hour with 1800 calories at about 800 I.H.P., though the engine showed itself capable of reaching 1100 I.H.P. This proves that it is no longer true to say that gas-engines are only economical at full power, and that they lack elasticity.

THE EFFICIENCY OF ARTIFICIAL ILLUMINANTS.

During the course of last year, a lengthy serial article on the above subject appeared in the columns of the "Zeitschrift für Beleuchtungswesen," from the pen of Dr. H. Lux, the Editor of that Journal. After its conclusion, the communication was submitted to some revision and issued in the form of a pamphlet.

Dr. Lux's article consists of a detailed description of the apparatus and methods he has employed in his researches upon the practical efficiency of different sources of artificial light—that is to say, upon the proportion of the total energy originally impressed upon an electric filament, an incandescent gas-mantle, and the carbons of an electric arc, &c., which is recovered in the form of actual light. By way of introduction to his paper, Dr. Lux calls attention to the well-known fact that all sources of light hitherto utilized are extraordinarily wasteful of energy. This is due to the circumstance that by far the greatest part of the radiation they emit is made up of rays having wave-lengths exceeding $0{\cdot}8\mu$; whereas only the rays having wave-lengths between $0{\cdot}4$ and $0{\cdot}8\mu$ constitute what the human eye knows as light. The relationship existing between the visible and the invisible radiations of ordinary light sources has been investigated by Professor Lummer and his colleagues; while Professor W. Wedding has essayed the same problem, and has attempted experimentally to separate rays of light from those of heat by means of the Lummer-Kurlbaum bolometer—an extremely delicate instrument for detecting and recording radiation.

The results obtained by Dr. Lux in the course of his investigations into the proportion of radiant energy recovered in the form of light differ very seriously from those quoted by Professor Wedding. For instance, using a carbon filament glow lamp consuming 62·1 watts, Professor Wedding found the mean spherical radiation per square centimetre of bolometer surface at a distance of one metre to be equal to $26{\cdot}98 \times 10^{-6}$ watts; whence he calculated the total spherical radiation to be equal to 3·4 watts. This amount corresponds with 5·48 per cent. of the energy impressed on the filament, and represents the loss of energy to be 94·52 per cent. The foregoing figure for the total radiation is made up of all the rays of different wave lengths that are absorbed by a bolometer; but a little thought will show that it cannot be correct. The amount of energy radiated by a filament must, of course, be smaller than that impressed upon it, because losses occur through the production of heat, through resistance at the junctions between the filament and the connecting wires, through the opacity of the glass bulb to rays having wave lengths exceeding 3μ, through its absorption of ultra-violet rays, and through a failure of the bolometer—which is no "absolutely black body"—to respond to all the rays emitted. Still, it is impossible that the total of these losses can amount to 94·52 per cent. Moreover, if the curve given by Professor Lummer for the distribution of energy in the spectrum of the glow lamp is integrated, the space it encloses may be found equal to 392 units (on a convenient arbitrary scale); while if the curve is continued asymptotically, the region beyond the wave length 3μ will contain 61 of the same units. The latter is the radiant energy which does not escape from a glow lamp, and accounts for a loss of heat equal to 15·5 per cent. Heat conduction and the resistance of the lamp connections may account for a further loss of 20 per cent.; so that the total loss can hardly exceed 35 per cent. Furthermore, the actual experiments carried out by Dr. Lux on a glow lamp consuming 98·23 watts of energy show the mean spherical total radiation per square centimetre of bolometer surface at one metre distance to be equal to $5{\cdot}05 \times 10^{-4}$ watts; the total radiation being therefore 63·46 watts, which corresponds with 64·6 per cent. of the energy impressed on the filament, and shows the loss to be 35·4 per cent. Similar discrepancies between the requirements of theory, Dr. Wedding's results, and the experiments performed by Dr. Lux (hereafter described), occur with the incandescent gas-light and the Nernst electric lamp. These differences are exemplified in the upper part of Table I.

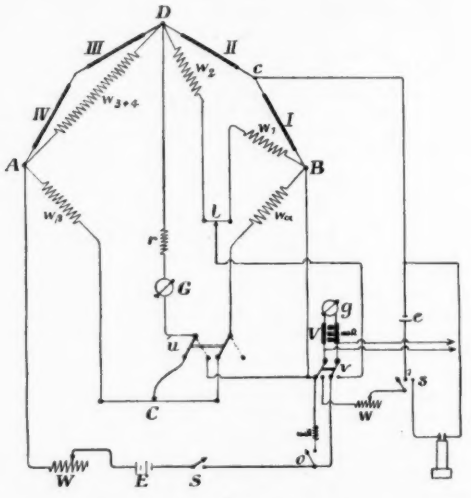
TABLE I.

Source of Light.	Incandescent Gas.	Carbon Filament Glow Lamp.	Nernst Lamp.
Mean spherical total radiation in watts × 10^4.			
Wedding	0·9035	0·2698	2·234
Lux	8·922	5·05	9·74
Total radiation in watts.			
Wedding	11 3	3·4	28·7
Lux	112·12	63·46	122·2
T max. (abs.) $\sigma = 5\ 32 \times 10^{-12}$.			
Wedding	1016	751	1274
Lux	1800	1560	1940
$\sigma = 4{\cdot}167 \times 10^{-12}$.			
Wedding	1082	799	1355
Lux	1915	1660	2060

Further evidence that Professor Wedding's figures cannot be correct is given by calculating the temperature of each radiant on the assumption that it obeys the laws of a "black body" according to the Stefan-Boltzmann formula. Kurlbaum has determined the value of the constant σ in that formula to be $5{\cdot}32 \times 10^{-12}$ watts per square centimetre. Lux considers this value too large; finding, as the result of experiments, which are elsewhere detailed, that a more correct value is $4{\cdot}167 \times 10^{-12}$. The maximum temperatures (the so-called "black" temperatures) on the absolute scale given for each of the three artificial illuminants concerned by the application of the two different values for σ when applied to the total radiation of the illuminants, as measured by Wedding and by Lux respectively, are recorded in the lower half of Table I. The higher value calculated from Wedding's data for the carbon filament—*i.e.*, 799° T, or 526° C.—is a temperature at which a substance only begins to be red hot; whereas a properly-driven carbon filament is white. On the other hand, the absolute temperatures calculated from the mean values for the total radiations observed by Lux agree well in order of magnitude with the "black" temperatures deduced from the Lummer and Pringsheim formula. Use of the latter makes the absolute temperature of the incandescent gas-burner and that of the Nernst lamp to be 2450°; while that of the carbon filament glow lamp should be 2100°. In the case of the Nernst lamp, the agreement is closer than in that of the others; but if the calculated temperatures of the incandescent gas-light and the carbon filament glow lamp are corrected for the absorption of rays exceeding 3 μ in length—*i.e.*, if the total radiation is assumed to be about 15 per cent. higher—the temperature of the gas-burner is made to appear 1980°, that of the glow lamp 1720°, which compare favourably with the figures in the lowest line of Table I. Hence Dr. Lux concludes that the values quoted by Professor Wedding to represent he mean spherical total radiation of the different illuminants he ested cannot be correct.

Bolometric Arrangements.

In the second part of his article, Dr. Lux describes the various methods of employing a bolometer adopted by previous investigators. The simplest plan is that given by Kurlbaum, in which two branches of a surface bolometer are connected in parallel with three thick manganin wires so as to form a Wheatstone bridge. In this arrangement, each of the wires has the same electrical resistance as the bolometer at a given temperature, or when a known volume of current is passing through the instrument. Between the bolometer and one of the resistances, a sliding mercury contact is connected, so as to adjust the bridge for any particular current. When the surface of the bolometer is exposed to radiation, the resistance of the blackened strips of platinum alters, and the galvanometer indicates a deflection proportional to the energy impressed upon the apparatus. In order to obtain readings in absolute units, a current of measurable volume is passed through the bolometer until the deflection is equal to that previously obtained under the influence of radiation. Since the



energy contained in the current is known, the energy contained in the radiations is also known, and can be returned in watts. Kurlbaum's method is very simple, and the apparatus is cheap to construct; but his bolometer has the defect of being extremely sensitive to changes in the surrounding temperature. Hence Paalzow and Rubens have designed a modification, in which two sets of four bolometer arms are joined together at a common point and connected up with a pair of resistances so as to form a bridge. It is, however, most difficult to prepare eight bolometer arms of equal resistance; and therefore Wedding has proposed a further modification in which two of the arms in each pair are replaced by resistances of manganin wire.

This arrangement can be seen by inspecting fig. 1 reproduced herewith, which, however, actually represents a different instrument designed by Lux, and will be dealt with immediately. As described by Wedding, his bolometer consists of two adjacent bolometer arms I and II, formed into a small bridge with two manganin resistances w_1 and w_2. From point D joining arm II with resistance w_2 another pair of adjacent bolometer arms III and IV, with a single manganin resistance w_{3+4}, lead to a second

junction A, from which two other resistances convert the whole four arms into a large bridge. Attached to the point D is a compensating resistance r leading to the galvanometer G, the second connection of which passes to a multipolar switch at the point B (which is not shown in the drawing). The points A and B are also connected through a battery E and a simple switch S, while the point c in the small bridge is connected to a point midway between the resistances w_1 and w_2, by means of a second battery, an amperemeter, an adjustable resistance, and a simple switch. This system of connections is quite correct, and should yield trustworthy results; but it would appear that in his actual experiments Wedding altered the arrangement. In place of joining together II, w_3, III, w_3+4, and r at the common point D, he used D only for the connection of II and III, and joined the manganin resistances to the wire uniting D with r at a point close to r. This change made no difference so long as the current flowing in the small bridge was under measurement; but when the operator proceeded to examine the conditions in the larger bridge, current flowed directly from the small battery into the galvanometer, as the point D (in Wedding's apparatus) did not stand at the same potential as B. In fact, when employing the Wedding arrangement, Lux found that current would enter the galvanometer even when the wire leading from the point D to the point of junction with the manganin resistances had a resistance of its own less than 0·1 ohm, and when each arm of the bolometer had a resistance of about 30 ohms. A plan for avoiding this difficulty is sketched by Lux, and consists in abolishing the direct junction between II and III, terminating those arms at different binding screws, and leading from each screw a separate wire to the actual spot where the manganin resistances are connected with the wire communicating with the galvanometer. It is doubtless to this defect in Wedding's bolometer that are due the erroneous conclusions he came to respecting the proportion of energy impressed on any illuminating unit recovered as light.

Dr. Lux proceeds to discuss various other modifications of the bolometer that give direct readings (for full details of which his original pamphlet must be consulted). In his own experiments, he employed either a simple bolometer, or the more complicated arrangement shown in fig. 1. In this figure, the four bolometer arms have resistances of about 30 ohms each; those of w_1 and w_2 being about 60 ohms; that of w_3+4 being about 122 ohms; and those of w_a and w_8 being about 40 ohms. The resistance of each mercury contact at l and C was about half an ohm. Current was led to the small bridge I, II, w_1, w_2, at the points c and l from the battery e, the circuit also containing the switch s, the adjustable resistance w, and the amperemeter g fitted with the Volkmann shunt V. Together with the shunt, the amperemeter had a constant resistance of exactly 100 ohms; while the shunt allowed the amperemeter to be adjusted for seven different quantities of current. The amperemeter could be inserted in, or removed from, the circuit of the battery e by the bipolar switch v. The galvanometer G, with its loading resistance r, was connected, by means of the bipolar switch u, with the points D B, and by adjusting the mercury contact l, the bridges could be equalized. When this was done, s was opened, and both v and u were thrown over to the left. G was then connected with D and C on the large bridge; and on shutting S, current from E, controlled by the adjustable resistance W, passed through G *viâ* A and B. By moving the contact C, the large bridge was then equalized; W enabling a definite quantity of current, having a volume shown on the amperemeter g, to be passed through the apparatus. The switch v was then thrown to the right, and, by means of o, the 100 ohm resistance was inserted in the circuit of E. This caused the same volume of current to flow in the large bridge as before; while the amperemeter remained available for measuring the current in the small bridge. The switch S was next closed, the bolometer arms I and II were exposed to the radiations, and the deflection of the galvanometer was observed. After shutting off the radiation, s was placed upon the contact 1 and, with the aid of the adjustable resistance w, and the amperemeter g, a current of known volume was passed through the small bridge until G showed the same deflection again.

In order to obtain checks upon the volumes of the electric currents, connections were inserted before the amperemeter leading to a standard battery and a compensator placed at the ends of the wires marked with arrow-heads shown in the figure; while a further connection carrying a telephone enabled the readings of the instrument to be revised by means of an alternating current. In using the bolometer, the current supplied by E was accurately adjusted to about 50 milliamperes, the bolometer arms were exposed to a source of constant radiation—*e.g.*, an osram lamp fed by an accumulator—and the deflection of the galvanometer was noted. The four bolometer arms were then connected up as a simple bridge; the current was adjusted to a known value of about 25 milliamperes; and the deflection was again noticed when the same source of radiant energy was employed. After repeating this process with several different currents, and correcting the deflections of the galvanometer for proportionality, curves starting from a common zero point were obtained by means of which the value of any particular deflection (when the apparatus was connected up as shown in the figure) could be ascertained by inspection.

Separation of Visible from Invisible Rays.

Dr. Lux proceeds to discuss the methods for the experimental separation of visible from invisible radiation of any source of light, dealing first with the proportion of rays having wave lengths lying between 0·4μ and 0·8μ, and omitting for the time all consideration of the physiological effect brought about by the tint of the light. The only precise method of separating visible from invisible rays consists in analyzing the radiation by means of a spectrobolometer, or spectrothermopile, and then determining the energy over the whole scale of wave lengths. This has been done for the more important artificial lights by Lummer and Pringsheim, and also for the Welsbach mantle by H. Rubens. The values obtained by these investigators have been plotted in the form of curves which have been lengthened, where necessary, asymptotically and submitted to planimetric measurement by Lux. On the basis that a carbon filament glow lamp, a Nernst lamp, and an incandescent gas-mantle, yield the total radiations found in Lux's experiments with the bolometer, as quoted in Table V. (to be referred to later on), the data given by Lummer and Pringsheim and by Rubens yield the results shown in Table II.

Table II.

—	Carbon Filament Glow Lamp.	Nernst Lamp.	Incandescent Gas-Burner.
Energy consumed . . .	98·23 watts	181·4 watts	715·7 watts
Total radiation—			
Between 0 and ∞ μ .	75·18 watts	122·20 watts	473·00 watts
,, 0 ,, 3 μ .	63·46 ,,	62 20 ,,	112·10 ,,
,, 0 ,, 0·4 μ .	0 19 ,,	0·87 ,,	0 ,,
,, 0·4 ,, 0·8 μ .	2·69 ,,	6·96 ,,	10·70 ,,
,, 0·8 ,, 1·1 μ .	8·05 ,,	8·06 ,,	1·72 ,,
Ratio of light to total radiation	3·5 per cent.	5·7 per cent.	2·26 per cent.
Ratio of light to energy consumed	2·74 ,,	3·85 ,,	1·5 ,,
Mean spherical illuminating power	24·5 hefners	94·9 hefners	89·6 hefners
Efficiency in watts per hefner	4 09	1·91	6·42 ,,

These figures however need to be used with caution, because the proportion of the total energy which is evolved in the form of wave lengths lying between 0 and 0·8μ is very small and difficult of measurement; while some of them have only been deduced by extrapolation. Moreover Lummer and Pringsheim only carried their investigation of the Welsbach light to the wave length 3·2μ—examining the burner inside a glass chimney, which was opaque to rays of greater wave length. Rubens continued his measurements as far as 15μ; finding small peaks in the curve between 2·2 and 3·5μ, between 3·5 and 5μ, and between 7 and 15μ. These peaks cover larger surfaces than the surface enclosed by the curve between the wave lengths 0 and 3μ—thus rendering the comparison somewhat uncertain. The figures nevertheless are very instructive, and give at least an approximate value for the mechanical equivalent of light. They also show that, in terms of energy expended, the efficiency of ordinary sources of artificial light, except the flame arc, is lamentable, and that scarcely any progress has been made since the days of barbarism. Two figures in Table II. demand special attention, as they may lead to misapprehension. From the mean spherical illuminating powers of the carbon filament lamp and the Nernst lamp respectively, it would appear that the latter consumes only half as much energy as the former in the development of unit light; whereas the figures quoted for the ratio of light emitted to energy consumed make the Nernst lamp stand to the glow lamp in the proportion of 3·85 : 2·74. This anomaly is explained by the larger proportion of dark red rays lying between 0·7 and 0·8μ in the carbon filament lamp, which form nearly half the radiation emitted; while in the corresponding region of the Nernst lamp, the proportion is only one-fifth. These red rays produce very little effect on the eye; and therefore the relative efficiency of the carbon filament is much higher than its physiological effect would make it appear to be.

Apart from the recognized physiological difficulty of separating luminous from non-luminous radiations by physical means, the process of analysis already described can only be carried out in the best equipped laboratories; and even then the work involved is extremely protracted. [Rubens, for example, undertook as many as 70 measurements in different parts of the spectrum between 0·45 and 18μ (*sic*) during his investigation of the Welsbach mantle.] Hence attempts have been made to separate visible rays collectively from invisible radiation by the use of some absorbent fluid. Water, for instance, in layers of sufficient thickness—say, 20 inches—absorbs all rays having wave lengths exceeding 1·1μ; while a solution of iodine in carbon disulphide absorbs all rays between 0 and about 1·1μ, and also all rays exceeding 2·8μ in length, allowing about 60 or 70 per cent. of the rays between 1·1 and 2·8μ to pass. Unfortunately, the fact that the solution of iodine in carbon disulphide passes rays between 0·8 and 1·1μ renders it useless for the purpose in view, inasmuch as the energy emitted in that region may exceed the energy emitted in the form of light. As reference to Table II. will show, the energy contained in the dark rays of a carbon filament lamp may be 2½ times as great as the energy in the light rays, although in the case of the incandescent gas-mantle the former may only constitute some 14 per cent. of the latter. Similar remarks apply to the use of water; and therefore the experiments carried out by Wedding, in which he used plain water as the absorbent, cannot be considered trustworthy. Lux is under the impression

that Wedding employed a layer of water only about 1¼ inches in thickness—a device which would hardly begin to absorb rays shorter than 2μ in length. In a word, the limits of transmission exhibited by water and by a solution of iodine do not agree with the limits of the spectrum visible to the human eye. Black glass, black mica, such colour filters as are used in three and four colour photography, also absorb more or less invisible rays, and if employed for such purpose as now contemplated may produce errors exceeding several hundreds per cent.

In fact, the only substance that can be used to give a fairly correct idea of the total proportion of radiation which lies within the visible spectrum, is a strong solution of ferrous ammonium sulphate in a layer at least 4 inches thick. The absorption of this liquid begins at about the point 0·72μ; but since the visible rays of greater wave length are of little practical importance, it may be said to absorb invisible radiation only. The liquid naturally absorbs some of the visible rays; but the magnitude of this absorption can easily be ascertained by using the photometer to determine the illuminating power of the light source under investigation, both with and without the interception of a cell containing the necessary quantity of reagent. As the radiation emitted by most sources (except electric arcs) is homogeneous in all directions, the rays may be considered to have approximately the same temperature everywhere, and therefore a measurement of the relationship between the light and the invisible rays need only be carried out at one angle. By operating with the bolometer in this manner at a horizontal angle, and making the allowance shown by the photometer to be necessary for the absorption of light rays by the ferrous ammonium sulphate, the author has obtained the figures recorded in Table III. for the light sources there mentioned. The values placed within parentheses in the last column of Table III. are reproduced from Table II. for convenience in comparison. As already mentioned, they were deduced by integration; and it will be noticed that they agree fairly well with the figures obtained experimentally by the use of ferrous ammonium sulphate.

TABLE III.

Source of Light.	Q. Total Horizontal Radiation Per Sq. Cm. at 1 Metre Distance Watts.	L. Horizontal Light Radiation per Sq. Cm. at 1 Metre Distance Watts.	L ÷ Q. Per Cent.
Carbon filament glow lamp .	$6{\cdot}48 \times 10^{-4}$	$0{\cdot}207 \times 10^{-4}$	3·19 (3·5)
Nernst lamp	$12{\cdot}48 \times 10^{-4}$	$0{\cdot}669 \times 10^{-4}$	5·40 (5·7)
Incandescent gas-mantle without chimney . . .	$13{\cdot}40 \times 10^{-4}$	$0{\cdot}312 \times 10^{-4}$	2·33 (2·26)

It is also possible to use a selenium cell for the separation of the visible rays; but results cannot be obtained with it in absolute units, while the maximum of delicacy of the cell lies at about the point 0·7μ, whereas the maximum of sensitiveness of the human eye is between 0·55 and 0·59μ. Angström's method is actually better than the employment of any light filter. In his process, a spectrum of the radiant is obtained from which the visible portion is separated by a stop, and then reunited into the form of white light by means of a cylindrical lens. The ray so obtained is measured by the photometer, and the energy in it measured by the bolometer. After an undecomposed ray coming from the same source has been submitted to photometric and bolometric investigation in the same way, data are ready for calculating the proportion of light to the total energy emitted. Angström's method is obviously free from the errors in principle which accompany the use of any light filter, but all these processes have the defect of ignoring the physiological action of the light. If all the rays having wave lengths lying between 0·4 and 0·8μ are measured collectively, a physical idea is obtained of the economy of the light quite different from that obtained by the human eye, because equal efficiency is attributed to all the rays of different wave lengths lying between those limits. When, however, the energy emitted in each part of the spectrum is measured separately, the curve obtained gives a correct picture of the economic value of the light, and the student can see in what direction it is desirable to increase the emission so that the eye may most readily respond to it. That light must be regarded as perfect in which the maximum of the energy emitted occurs in the region where the eye is most responsive, and in which the light rays of other wave lengths are present in the same relative intensities as in the sun. Although the eye is chiefly sensitive to rays between 0·55 and 0·59μ, it is not desirable that a source of light should be principally composed of such rays since a light composed in this manner would have æsthetic defects for which its extreme economy would be a poor compensation.

THE AUTHOR'S APPARATUS.

In most of the experiments carried out by Dr. Lux, the bolometer was arranged in the simple form already described, having four equal branches, which possessed a resistance of, roughly, 30 ohms each, at a temperature of 16° C. The current employed had a volume of 25×10^{-3} amperes. The galvanometer was placed in series with a resistance of 400 ohms; its limit of delicacy being 6×10^{-9} amperes per 1 mm. of deflection at a distance of one metre of the scale. Its deflections were calculated into watts by arranging the connections in the manner shown by fig. 1. Corrected for proportionality, the deflections then corresponded for each 1 mm. of the needle with energy equal to $1{\cdot}86 \times 10^{-6}$ watts per square centimetre of bolometer surface. The source of light and the bolometer were supported on carriages running upon the bar of a large photometer; their distances apart being read off on the bar graduations and corrected in the usual manner for a distance of 100 centimetres. The zero point of the bolometer was considered to be the mean between two of the exposed arms. The precise distance of this zero from that of the light was measured by means of a cathetometer erected on a carriage and running on a second bar strictly parallel with that of the photometer. With the aid of a vernier, the distance could be read off to 0·1 mm. The two adjacent bolometer arms were exactly 4 mm. apart; and each consisted of ten strips, 2 mm. wide, 33·9 mm. long, and 1 mm. apart. The total breadth of surface exposed to the radiations was 31·15 mm.; the surface itself being, therefore, 10·56 square cm. Calculated from the resistance, the specific conductivity of the platinum, and the dimensions quoted, the thickness of the bolometer metal was found to be approximately 0·0005 mm.—*i.e.*, 0·5μ. The four arms of the bolometer were fastened to slate supports carried in ebonite frames, as described by Lummer and Kurlbaum; two of the surfaces being separated from the other two by a blackened metallic partition. The entire bolometer was placed in a wooden casing with a door at either end; a thermometer graduated in 0·2° C. passing through the top. In order to protect the bolometer from stray radiation when the door was opened, a camera bellows was fitted in front, held in position by means of slotted brass bars. A cell supporting a movable opaque diaphragm or drop-shutter was fixed between the source of light and the bolometer to protect the latter from all radiation when required. The shutter itself could be worked from the observer's usual position, and consisted of a copper vessel covered with black velvet, through which water was kept constantly circulating by means of a pump driven from an electric motor. The fluid used to cut off the heat rays was a strong (saturated) solution of ferrous ammonium sulphate dissolved in water acidified with sulphuric acid; the thickness of the layer of liquid being 10 cm. In order to ascertain the amount of light absorbed by this reagent, measurements were made, by means of the photometer, of the illuminating power of every source of light investigated; coefficients being thus obtained to represent the proportion so absorbed.

For the purpose of estimating the mean spherical illuminating power of the light sources, measurements were made at different vertical angles in the usual fashion. When the light was symmetrical about a horizontal plane, this was done through one meridian of the rays only; when the light was not symmetrical, similar measurements were made in two meridians at right angles to one another. The apparatus employed for this purpose was either a three-mirror photometer, like that described by H. Krüss in 1898, or, when the lights were of large dimensions, either with an angle photometer or with the two-mirror apparatus designed by Martens. The flame-arc lamps were tested with the Ulbricht sphere. Lux found considerable difficulty in employing the bolometer in a similar fashion to determine spherical total radiation, for the instrument was so extremely sensitive to currents of warm air. This disturbing effect was reduced to a minimum when the bolometer was arranged vertically so as to measure horizontal total radiation; but in every other position very serious errors were introduced. Wedding has suggested protecting the bolometer by means of a thin glass, and making special allowance for its coefficient of absorption. But even this process does not protect the instrument from all stray heat; while, on the other hand, a thin glass absorbs rays of longer wave lengths. The error is specially conspicuous when such sources of light are being tested as send rays of very different composition in different directions, as is the case with the arc lamp and incandescent gas-burner.

For these reasons Lux abandoned the plan of using the bolometer to determine total radiation at different angles, contenting himself with measurements in a horizontal direction. To ascertain the total radiation in other directions, he employed the form of thermopile designed by Rubens, which was enclosed in a thick tube of brass with a second tube passing through the side. The thermopile was carried on the revolving arm of a lampstand, so that it could be presented to the light at any angle. It was protected from the direct action of hot combustion products by means of an extremely thin plate of mica; this material being employed because it transmits a large proportion of rays of even very considerable wave lengths. The readings of the thermopile were checked against a Weston cell with the aid of a Feussner compensator; so that the E.M.F. corresponding with each deflection of the galvanometer needle could be read directly. In this manner, from the ratio existing between the total radiation emitted in a horizontal direction and measured by the bolometer, and the readings of the thermopile, the total radiation at other angles could be calculated. The individual values for the E.M.F. were plotted on a polar or a Rousseau diagram; and the mean spherical radiation per square cm. of bolometer surface at 1 metre distance was deduced by planimetry.

(*To be continued.*)

The current issue of the "Iron and Coal Trades Review" contains a full abstract of a paper on "Co-partnership," read by Sir George Livesey before the Great Western Railway Lecture and Debating Society.

GAS CONSUMPTION OF PILOT-LIGHTS.

At the last Meeting of the New England Association of Gas Engineers, one of the inquiries found in the "Question-Box" was: "What is the net result of the increasing use of pilot-lights?" In reply to it, the Vice-President said he would give some figures from his record of tests. He had endeavoured to determine the quantity of gas consumed by bye-passes of single-mantle burners, as registered by meters which had been in service. The test covered a period of 12 hours; and the bye-pass used was the kind fitted on the Welsbach or other make of single-mantle burners. In the following table are shown the size of the meter, the length of time it had been in service since the last test, the test on the removal of the meter from service, and the quantity of gas consumed by the bye-pass burner as registered by the meters:—

Size of Meter.	Time of Meter in Service.	Test of Meter on Removal.	Consumption. Cubic Feet.
5-light	2 yrs. 6 mos.	Correct.	Nil.
5 ,,	6 months	4·8 p. ct. slow.	0·25
3 ,,	9 ,,	Correct.	Nil.
3 ,,	1 yr. 10 mos.	,,	0·75
5 ,,	3 yrs. 10 mos.	1·2 p. ct. slow.	1·30
5 ,,	1 month	1·0 p. ct. fast.	0·12
5 ,,	4 months	1·5 p. ct. slow.	0·50
5 ,,	1 yr. 6 mos.	1·0 p. ct. fast.	Nil.
3 ,,	2 yrs. 11 mos.	Correct.	0·75
3 ,,	1 month	0·8 p. ct. fast.	1·00
5 ,,	9 months	1·0 p. ,, ,,	0·60
5 ,,	8 ,,	1·2 p. ct. slow.	0·50

These figures, said the Vice-President, showed an average of 0·96 cubic foot of gas per meter per 24 hours. The bye-pass burners tried on a test-meter consumed from 1·86 to 2 cubic feet per 24 hours, showing a loss to the Company of (2 feet—0·96 cubic foot) 1·04 cubic feet per bye-pass. Consequently, 1000 single bye-pass burners in use would mean a loss of 1040 cubic feet per day. If there were several burners consuming gas through the same meter, the probabilities were that the meter would register more nearly correctly. They had tried several of the meters, and they did not register anything with one bye-pass, but with two or more in use the meter moved to some extent. Though the loss per annum on 1000 bye-pass burners would amount to 379,600 cubic feet, yet the convenience to the customers through their use more than compensated for the loss. The Vice-President added that the lesson to be drawn from the tests was to endeavour to have more than one bye-pass burner on each meter.

Mr. Gardiner remarked that in the case of a company selling gas at $1 per 1000 cubic feet he thought it would be a good plan to stimulate the use of bye-pass and pilot-lights for the reason that, in the first place, it would be good for the service, as it would improve it, and the customers would like them if they could get them cheap enough; and, secondly, from the revenue point of view, the large volume of sales to be obtained in a small way individually would appreciably increase the total of sales. In some trials he had carried out, the pilot-lights were submitted to careful test, and showed that the meters, on an average, registered only 60 per cent., which, therefore, was equivalent to selling gas at 60 c. per 1000 cubic feet. In view of this, they did not see their way clear to pushing the matter. Major Hinman said it seemed to him to be a good plan for consumers using pilot-lights to look after their meters and keep the valves tight. If they did this, they would get better registration. Every meter manufacturer sent out meters that would register correctly with a pilot-light when the meter was new; and if the valves were kept clean, it would continue all right. It would also seem that a meter with large valves was not desirable when pilot-lights were used. The increased capacity of the meter would not come in, and it could not be employed to advantage with pilot-lights, because there was so much more chance of leakage with large valves than with small ones. On being asked how long he thought most meters would keep their valves tight enough to hold one pilot-light, the speaker said it depended entirely upon the gas sent through. He had tested meters which had been in use for about twenty years and still had tight valves.

French Gas and Electricity Directory.—We have received from the office of the "Journal de l'Eclairage au Gaz et à l'Electricité," the edition for the present year of the "Répertoire des Industries Gaz et Electricité." The work was founded in 1895; but it has been much improved of late years. The contents, which occupy nearly 700 pages, are divided into three parts. In the first will be found a list of the learned societies and professional syndicates connected with the gas and electric light industries; an alphabetical list of all directors, managers, engineers, &c.; and a list (arranged according to departments) of gas-works and central electric supply stations. The second part is devoted entirely to gas, and contains lists of the companies owning works in France; of the towns in France, Algiers, and Tunis possessing works; and of apparatus makers, gas and water fitters, &c. The third part furnishes similar information with regard to electricity, including lists of the towns in France and her Colonies possessing electric tramway systems. The book has been produced under the direction of M. Maurice-Germain, and is published at No. 7, Rue Geoffroy-Marie, Paris, at the price of 3 frs. 85 c., which includes postage to places outside France.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Managers Hiring Coal-Waggons to their Own Undertakings

SIR,—For some considerable time, the above practice has been in operation; and I have heard of cases in which 1s. per ton waggon hire has been obtained by the engineer of the works, when the ordinary hiring rate was 6d. per ton. I am, therefore, very anxious to see defined the difference between a manager receiving a commission on coal, and hiring waggons to his undertaking. The line between the two in my opinion is so small that the distinction is hardly discernible. Am I right?

GEORGE HELPS.

Nuneaton, April 23, 1908.

Sulphate Saturators.

SIR,—My attention has been called to an illustration in your issue of the 14th inst., of what is called "Williams and Fenner's sulphate saturator." I beg to say that this is clearly an infringement of the patent No. 2840 of 1905 granted to me, and which was described and illustrated in the "JOURNAL" for Dec. 5, 1905, p. 688.

GEO. PETTIGREW.

Thornaby-on-Tees, April 18, 1908.

Making Connections in Gas-Mains under Pressure.

SIR,—It is with pleasure that I am able to announce the fact that, after much thought and trouble, I have now been able to bring forward a method of dispensing entirely with the use of gas-bags in mains, whether large or small, and of inserting instead valves, which I propose to place and fix in the main entirely under pressure, and without disturbing the flow of gas until the moment of closing down the valve. This, you will see, is quite a different arrangement from my system of making branch connections under pressure, and much more important and valuable, for now mains can be shut down with perfect safety for alterations or repairs without having to depend upon the more or less unsatisfactory and unreliable use of gas-bags and stoppers.

My object in writing is simply to state that I am able not only to fix these valves, but also to remove them after the occasion of their use has passed, and they can be employed over and over again on other or the same pipes. I shall send full particulars and illustrations as soon as I have prepared the patent specification.

A. O. RUSCOE.

Queen Anne's Chambers, S.W., April 24, 1908.

Reports of Proceedings of Scottish Junior Gas Associations.

SIR,—With reference to the report in the "JOURNAL" for the 14th inst., regarding the annual general meeting of the Scottish Junior Gas Association (Western District), I am reported to have made some remarks prejudicial towards the Technical Press; and, as your report is somewhat misleading, perhaps I might be allowed an opportunity of stating the real facts.

In the first place, I should like to point out that, in bringing the question of printing the book of "Transactions" before the meeting, I did so with no disrespect towards either the Technical Press or the management of the Association; and, further, my remarks were not directed towards the Press, either directly or indirectly. On the contrary, I prefaced my remarks by acknowledging how much the Association were indebted to the technical journals for devoting so much of their space to publishing its proceedings; and, I believe, had it not been for the assistance received in this direction from the "JOURNAL," the Association could not have found itself in so flourishing a condition as it presently is.

My reason for moving that the practice of reprinting the proceedings from the "JOURNAL" should be discontinued, was because I consider the book not sufficiently comprehensive in its present form; and I am of opinion that it could be improved upon without incurring much (if any) extra expense.

In conclusion, I wish to point out that I have no grievance whatever against the Technical Press; and I trust the above will clear up any misunderstanding that may have arisen out of my remarks.

PETER MACDOUGALL.

Helensburgh Gas-Works, April 23, 1908.

[Mr. MacDougall may be reminded that it was not reported in the "JOURNAL" that he "made some remarks prejudicial towards the Technical Press." There is an expression in "Notes from Scotland" that he had "a grievance with regard to the quality of the work done in the Technical Press, upon which part of his subject he made some remarks which were the reverse of complimentary." This is somewhat different. In the same issue of the "JOURNAL," a report was given of Mr. MacDougall's reasons for proposing a change in the printing of the "Transactions" of the Association. As his remarks were not technical, and would have taken too much space, only a summary was given. Perhaps Mr. MacDougall thinks (to use his own expression on that occasion) that "the most valuable part did not appear," which is a frequent grievance with junior speakers.—ED. J. G. L.]

Sales of Shares.—At a recent sale, 200 shares of £5 each in the Camborne Gas Company fetched an average of £5 7s. each. On the 15th inst., Messrs. T. J. Barnett and Son sold some consolidated stock of the Wolverhampton Gas Company at prices ranging from £207 to £210 5s. per £100 of stock, and some new ordinary 6 per cent. stock at £128 10s. and £129 per £100.

LEGAL INTELLIGENCE.

CHARGE AGAINST A LATE MAIDSTONE GAS OFFICIAL.

The Acquittal of Mr. Herbert Kindler.

As has already been recorded, the trial took place on Saturday, the 11th inst., at the Maidstone Borough Quarter Sessions—before the Recorder, Mr. H. F. Dickens, K.C.—of Mr. Herbert Kell Kindler, aged 38, who was until lately Assistant-Manager of the Maidstone Gas Company. Defendant was indicted for "obtaining by false pretences, from William Day, jun., an order for the payment of money, called a banker's cheque, of the value of £300, on Feb. 17." A second count charged him with "obtaining credit with intent to defraud, under the Debtors' Act."

Mr. PITMAN (instructed by Mr. S. Lance Monckton) conducted the prosecution; and Mr. THORN DRURY (instructed by Messrs. Brennan and Brennan) appeared for the defence.

Mr. THORN DRURY, at the opening of the case, raised an objection to the second count, on the ground that the provisions of the Vexatious Indictments Act had not been complied with; and this portion of the charge was struck out.

Mr. PITMAN explained the circumstances that led up to the charge, and which were fully reported, in connection with the Police Court proceedings, in the "JOURNAL" for March 24 (p. 777). He said that prisoner commenced in a small way in 1903-4 to deal in the stock of the Maidstone Gas Company; but in the latter part of 1907 the dealings became very extensive. He then had three banking accounts; but it was only necessary to refer to the one at the North Eastern Bank, Stockton-on-Tees, where he had a turnover between Aug. 1, 1907, and Dec. 31 of the same year of £16,237; while between Jan. 1 and Feb. 17 of this year his turnover was £18,234. During the period from Aug. 1 to Feb. 17 last, 36 cheques were drawn by defendant on "self," on the Stockton Bank, for the sum of £1973. Though defendant's account went smoothly at first, it was evidently in a most "troubled" condition during February; and considerable correspondence ensued on the subject between Mr. Thornhill, the Manager, and defendant. Cheques were frequently issued and presented for payment when there was no money to meet them. As a result, it was intimated to defendant on several occasions that he must explain the nature of his numerous transactions; and, further, that he must keep his account in credit. Defendant eventually wrote promising to call at the bank on Monday, Feb. 17; but this he did not do. Only two days previously Mr. Thornhill had written very plainly concerning a cheque for £900 which he had dishonoured, and telling defendant he ought never to have issued it. Further, defendant was requested to refrain from issuing any additional cheques on his account until he had fully explained his position. On Feb. 17—the very date when defendant went to Mr. Day—Mr. Thornhill had to write again, stating that he had received cheques for sums amounting to £2676, and that there was not sufficient money to meet them. On Feb. 18, Mr. Thornhill wrote to defendant informing him that several more cheques had been presented for payment, and that there was no money to meet them. He accordingly requested him to close the account and take back his securities. At this time prisoner's accounts at the two Maidstone banks were both overdrawn. On Feb. 17, defendant went to Mr. Day, and told him he had bought some debenture stock, and had to pay for it that day, and asked him to lend him £300, saying that he would have the money the following morning, and would bring it to him. "If I do not have the money," defendant said, "you pay in this cheque," giving Mr. Day a cheque on the Stockton bank. The charge against defendant was that he falsely pretended to Mr. Day that this cheque, which was dated Feb. 18, was good and valid security for the £300, and that he had authority to draw the cheque on the Stockton bank. The evidence would clearly show that when defendant gave the cheque he knew he was in troublous waters; that cheques of his had been returned; and that there were cheques out which might be presented upon the bank at any moment, and which amounted to £7405 11s. Under these circumstances, defendant could have no reasonable doubt in his mind at the time he drew the cheque that it could not be met.

Mr. *C. F. Thornhill*, Manager of the Stockton bank, bore out Counsel's statement, and said on Feb. 15 the following cheques drawn by defendant were returned: Feb. 15, £900; Feb. 18, £75, £1550 10s., £655, £141 11s., £330, £750, £110; Feb. 19, £255, £300, £225; Feb. 20, £150, £250, £265, £520, £825; and Feb. 21, £103 10s.—making a total of £7405 11s.

In cross-examination, witness said on the night of Feb. 16 defendant's account was in debit to the extent of £110; and the bank held securities for £78. On the night of Feb. 17, he was in credit to the extent of £60. On this day they did not dishonour cheques to the value of £2500, but held them over, because witness thought there was a possible chance of defendant meeting them. The account was not stopped until Feb. 18. He admitted that on Dec. 27 defendant was overdrawn to the extent of £129; and on Sept. 27 he was overdrawn by £183. The account was, however, placed in credit the following day.

Mr. *Day*, the prosecutor, who is an auctioneer and a Director of the Gas Company, said defendant had bought Maidstone gas stock at his sales. On several occasions witness had sold stock in small quantities on his account. On Feb. 17 defendant called on him, and said: "I have bought some of our debenture stock; and I have to pay for it to-day. Can you let me have £300? I have no certificate to offer you. I shall have the money to-morrow. I will give you my cheque; and if you pay that in to-morrow, it will be met in the ordinary way." Defendant then handed him the cheque, which was dated Feb. 18. Witness did not observe the date of the cheque until the following morning. Witness gave defendant a cheque for £300 on the Union of London and Smith's Bank.

Mr. PITMAN: What induced you to part with that cheque to Kindler?

Witness: His statement.

Mr. THORN DRURY: You know now that he did, in fact, pay for the debenture stock that day, and that his cheque given in respect of it was met that day?

Witness: I do not know.

As a matter of fact, defendant sat down and wrote his cheque after you had given him yours?—I really cannot answer that question. I have no recollection of him sitting down.

He gave you his cheque after he had received yours?—Yes.

The RECORDER: Before you gave the cheque, did he mention he would give you his?

Witness: Most distinctly.

Evidence was then given by two Maidstone bank cashiers as to the overdrawing of defendant's accounts. The cashier of the London and Provincial Bank said that on Feb. 17 the defendant paid Mr. Day's cheque for £300 into his account, and, drawing a cheque for that amount, he took it away in notes.

Mr. *Tomlin* and Mr. *Cox*, who had had dealings with defendant, stated that they received money from him in notes on Feb. 17.

Prisoner then gave evidence on his own behalf. He said he used to buy and sell Maidstone gas stock on behalf of other persons. He could not always do this at a profit; but as he promised the people to pay them a profit, he felt bound to do so. He himself had made nothing out of it; and he was now penniless. Some of the money he drew from the Stockton bank he paid into Maidstone banks; and the remainder he paid away in profits on cash transactions. His dealings were with people of all classes in Maidstone. He had a great deal of difficulty in keeping his banking account going. He used to have cheques out, and then provide for them at the last moment by borrowing the money and promising large profits. To these people he gave a cheque as security. On Feb. 17, he gave a cheque for £441 in payment for debenture stock which had been bought some days before. He told Mr. Day he had to pay for it then.

Mr. THORN DRURY: Did you telegraph to the North Eastern Bank, saying: "Pay Hamilton White and Chambers," who were to receive payment for this debenture stock?

Witness: Yes.

Did you get a telegram back "Hamilton White paid"?—Yes.

If you had not got that telegram, what were you going to do?—Wire Mr. Day's money to pay that cheque to Hamilton White and Chambers, as I had told him. I did not part with Mr. Day's money until I knew that Hamilton White and Chambers were paid. I fully intended to repay Mr. Day the money, which I looked upon as a loan.

The RECORDER: What did you intend to pay it out of?

Witness: The proceeds of debenture stock and other money I had.

Mr. THORN DRURY: Did you keep any books recording these transactions, or fill in the counterfoils of your cheque-book?

Witness: No; I trusted to my memory as to what cheques would be due.

The RECORDER: You are absolutely in the dark about your transactions. You cannot be surprised at getting into trouble, carrying on business in this extraordinary way. He added that the proceedings were most reckless.

Mr. PITMAN (in cross-examination): Can you give us the amount of liabilities brought upon you? The cheques returned were over £7000?

Witness: Yes; but I have not been pressed to pay any.

It would not have been much good pressing you, would it?—It might not.

Are there other cheques outstanding in addition to these for a very considerable amount?—Yes.

Can you give us some idea of the amount altogether of unpresented cheques at the three banks?—No; I could not.

"Barker, in the employ of corn merchants." What were your transactions with him?—I sold him some stock; and I paid him a small profit to carry it on.

Did he pay you for the stock?—Yes.

And you never delivered him any stock or gave him his money back?—I have given him a certain profit.

I suggest you have not given him a penny?—I paid him twice £3.

How much did you get from him?—£86 or £81; I am not sure.

You got £81 from this man, and gave him £6 back?—I fully intended to transfer the stock to him.

When was this transaction?—Some time in January.

The RECORDER: You bought some stock for him, but never delivered him any?

Witness: When it was due to deliver, I said: "If you like to turn it over, I will pay you a small profit," and he was agreeable.

Mr. PITMAN: What did you do with the stock eventually?

Witness: Some of it is in the banker's hands now.

"Sheather." What is his position?—A retired gentleman.

What were your transactions with him?—Similar to Barker's. I bought some stock for him. I delivered it, and asked him whether he would like to turn it over again, and take the profit; and he agreed to do so.

What money did he hand to you?—He handed me £420, I think.

What has he had for it?—£20.

The RECORDER: What became of the capital?

Witness: The capital is in my liabilities. It went to pay profits to other people.

Mr. PITMAN: What did you do with Mr. Day's money. When did you find that Hamilton White and Chambers had been paid?

Witness: When I had the wire from the bank.

Why did not you take Mr. Day back his money?—I gave him the cheque.

But the cheque was not worth much, was it?—If I had provided for it, it was; I fully intended to do so, with the money I received for the debenture stock.

How were you to provide for all the cheques that were outstanding?—I was going to arrange with the people—to ask them to hold over their cheques.

The RECORDER: You were going to make arrangements by shifting the debt on to someone else.

Mr. PITMAN: You took the debenture stock with you and went off to London and sold it. What did you get for it?

Witness: Something like £350.

What did you do with the money?—I paid off some of my pressing liabilities.

Did not you take out a policy in the Mutual Office?—Yes, with part of it.

How much did you spend on that?—£120.

Where did you send the balance?—To my father-in-law. I owed him money for a cheque that was dishonoured.

Some of the employees of the Gas Company have lost money?—Yes; but I understand they have been provided for.

Re-examined by Mr. THORN DRURY: He understood these employees had been paid by Mr. George Marsham, the Chairman of the Company.

Mr. THORN DRURY: Are there bankruptcy proceedings pending against you?

Witness: Yes.

Can you show by reference to your bank-book numerous persons to whom you have paid large sums?—Yes. On Jan. 1, Stiles £60, profit on £500.

Was that profit ever really made?—It was not made; it was what I promised to make.

The RECORDER: How a man in his senses could do a thing like this, I cannot understand.

Witness proceeded to give numerous similar instances, and said he could show a great many more of the same kind.

The RECORDER, in summing up, remarked that he had very little sympathy with those people who had lost some capital in these transactions, particularly having regard to the circumstances connected with them. (Applause.) He pointed out that Mr. Day had nothing whatever to do with these transactions. In considering their verdict, the Jury were justified in taking into consideration the character of the whole of the transactions, and the fact that cheques to the value of £13,000 had been drawn before Feb. 15, and were unpresented. If they felt that defendant had been guilty of merely astounding folly or reckless and unreasonable conduct, the case had not been proved. On the other hand, if they, as business men, considered defendant obtained the money without intending to refund the £300, they must find him guilty.

The Jury then retired, and after a short deliberation returned a verdict of "Not guilty"—a finding which was received with some applause in Court.

The Failure of a Promoter of the Kent County Gas Company.

The adjourned first meeting of creditors under the failure of Walter Darby, of 21, Great Winchester Street, E.C., was held at the London Bankruptcy Court last Thursday. The debtor, it may be remembered, was charged with conspiracy, at the Mansion House, in conjunction with Henry Warwick Gyde (see *ante*, p. 174). He had not surrendered; and it was stated by the representative of Mr. Dade, the debtor's Solicitor, that it was believed he had disappeared. The matter was left in the hands of the Official Receiver, to be wound up in bankruptcy; the next stage in the proceedings being the sitting for the debtor's public examination on the 13th prox., after which, if still in default, an application can be made to the Registrar for a warrant for his arrest.

Interstate Water Rights in America.

An interstate water rights case of great importance has just been settled by the Supreme Court of the United States. Some time ago, the Courts of New Jersey decided that the Hudson County Water Company had no right to sell water gathered from the Passaic River in that State to the Borough of Richmond, in the State of New York. The Company appealed from this decision to the Federal Court, on the ground that the ruling was unconstitutional because it interfered with interstate commerce and with property rights. The United States Supreme Court has just decided that the State has a perfect right to prohibit the sale of any water gathered within its boundary to parties outside the State limits. The decision runs as follows: "The private right to appropriate is subject not only to the right of lower owners, but to the initial limitation that it may not substantially diminish one of the great foundations of public welfare and health. We are of the opinion, further, that the constitutional powers of a State to insist that its natural advantages shall remain unimpaired by its citizens are not dependent upon any nice estimate of the extent of present use or speculation as to future need." "The decision is particularly important," says "Engineering Record," "because it will greatly help the work of the New Jersey State Water Supply Commission, which has been entrusted with the task of preparing plans for conserving the water resources of the State. This Commission has reached the conclusion that the conservation of water and the prevention of floods in the Passaic Valley will both be best served by constructing a reservoir at Mountain View at an estimated cost of about $7,500,000. Repeated investigations have shown that the rapidly increasing population in the district lying about Newark will shortly demand far more water than the present works can supply; and a number of investigations have indicated that the cheapest method of furnishing this additional water is the construction of a great reservoir at the site suggested. This basin will hold back the waters which periodically cause disastrous floods in the cities of Paterson and Passaic, and will furnish an additional supply at a cost per million gallons which is probably lower than that paid by the communities for their present supplies. The projected work is one of the most useful which has been contemplated by any State for some time."

Found Drowned in a Reservoir.—On Good Friday, the body of a man was found in a reservoir belonging to the Thirsk District Water Company; and it was subsequently identified as being that of William Carter, a labourer. At the inquest, the Jury returned a verdict of "Found drowned;" and they added two riders—one that a communication should be sent to the Water Company suggesting that the water in the reservoir should be run off, as the body had been in for some time, and the other that a higher fence should be put round the reservoir.

MISCELLANEOUS NEWS.

THE FRANCO-BRITISH EXHIBITION AND GAS PLANT MANUFACTURERS.

Meeting of Representative Manufacturers and the Committee.

The Chairman (Mr. H. E. Jones) and the Hon. Secretary (Mr. J. W. Helps) of the Committee of the Gas Engineering Section of the Franco-British Exhibition, recently addressed the following letter to a large number of firms representative of gas plant and appliance manufacturers:—

As probably you are aware, the Committee of the Gas Engineering Section of the above exhibition, have arranged to erect in a prominent position in the Machinery Hall an important exhibit, which will include a series of apartments lighted and heated throughout with gas, and in which the most economical methods of cooking, heating, and laundry work will be displayed. They also hope to demonstrate in other departments some of the many ways in which gas can be efficiently and economically used in the various industries.

The whole expense of this scheme will be borne by a fund which is being contributed to by gas undertakings throughout the United Kingdom, as will be seen from the lists which have appeared from time to time in the columns of the Technical Press.

The Committee feel, however, that the utility and attractiveness of this exhibit would be considerably enhanced if it could be associated with examples and models of some of the more important machines and appliances which are manufactured in this country for use in modern gas-works; and they have reason to believe that there is every probability of their being able to obtain for such an exhibit some modifications of the terms upon which the space can be secured.

With the object of obtaining the views of manufacturers on this subject, they are arranging for a joint conference to be held at the Westminster Palace Hotel on Friday next, April 24, at 12.30 p.m., which they trust you will find it convenient to attend.

Accordingly the meeting was held—Mr. H. E. JONES presiding. Several of the members of the Committee residing in and near London were present, including the Hon. Secretary and Mr. J. H. Cundall, the Secretary and Manager to the engineering and shipping group. There were probably representatives of some thirty different firms present to meet the Committee.

The CHAIRMAN, in the course of his opening speech, expressed the gratification of the Committee at seeing their invitation responded to so well. The manufacturing firms had been asked to be represented there that day, because the Committee (which was essentially a Gas Engineering Committee) were a sub-section of a large general engineering section of the great Franco-British Exhibition. If they thought he was exaggerating in calling it a "great" exhibition, he would ask those present to go and see the enormous acreage, the splendid buildings, and the attractive way in which the whole place was being prepared. The exhibition was founded on the principle that had ever animated His Majesty the King in the promotion of friendly relations with neighbouring nations, knowing that such relations always led to better business connections. At the outset of the exhibition, certain unfavourable demonstrations and comments were liberally made which might possibly have had the effect of discouraging some of the firms in looking at the exhibition. But many who were well known to the firms (he would more especially mention one who had been a tower of strength, Mr. Corbet Woodall) felt with himself (the Chairman) that such an opportunity should not be missed of showing not only English people but Continental people that the industry of gas was still alive and very prosperous and vigorous, and that they had still engineering resources at their back in the gas part of the engineering work of England. Such an opportunity ought not to be lost. They did not at the time think it right to let the electrical engineers have a walk-over; but so far from having a "walk-over," the electrical people were evidently going to have a walk back. The Gas Engineering Section Committee had secured a considerable fund for the purpose of demonstrating at the exhibition what a convenient and beautiful servant gas is—considered domestically and in the workshop from the utilitarian point of view. Whether or not the manufacturers co-operated with the Committee, there was going to be at Shepherd's Bush a good exhibition for gas. Connected as most of the members of the Committee were with the large Gas Companies in and round about London, and all of them well known to the manufacturing firms, they were determined that this should be an exhibition in spite of the detraction or cold water that had been thrown upon it. Then came the question of how far the Committee could ask the manufacturing firms to promote the exhibition by contributing models, or even pieces of plant—plant perhaps prepared for some works that were already going on, and which, by permission of the gas-works managements, could be placed in the exhibition, if not wanted before next winter. He was sure they all had in them the spirit of the British trader and mechanical engineer, who wanted to show the world what he could do; and, on reflection, he felt certain they would see there was an opportunity here of not only doing justice to themselves, but to the great industry to which they all belonged. There would be a wing in the exhibition of French engineering exhibits; and he could say that the manufacturers of France were pushing very much the question of mechanical operation in gas-works. On their own side in this country, they wanted to be at least equal with their French friends. British gas plant had established itself in all parts of the world. The gas plant of this country was sent to Argentina, to America, to France, to Germany, to Australia, and to every other part of the civilized world. Therefore, he asked the manufacturing firms whether they would not help those British gas engineers who had shown a disposition to plant British gas apparatus in all parts of the world to at least maintain the prestige they had secured, by displaying worthy models or specimens of their productions at this exhibition. The Committee

had heard that the expense of the exhibition was the thing that chiefly hampered the manufacturing firms in considering the question of showing apparatus. The Committee had been in consultation that morning with Mr. Cundall, the Secretary and Manager of the Engineering and Shipping Group Committee; and he had enabled the Committee to say that, if the manufacturing firms would put before the Committee a suggestion as to the space that would be required to collectively show the various apparatus, they, as a Committee, would be able to sub-let the space, looking at it as a collective exhibit, on terms much more favourable than could be obtained by applying direct to the exhibition authorities. The reduction in price would be very material—something like 50 per cent. There was also the question of attendance for models and plant; and the firms might shrink from the cost of running expenses, and maintaining a staff for the purpose. He thought the Committee would be able to agree with the firms on this point. If the manufacturing exhibits reached a sufficient scale, this might be arranged so as to bring the expense down to a small matter. Their Hon. Secretary would be able to indicate to those who might apply the lines and terms on which this could be done; and they would not be such as would be likely to dismay those firms who were thinking of exhibiting. An exhibition which tended to advertise and promote the interests and trading receipts of any particular firm could not be made the subject of a free grant of space. This was a radical point in the matter. But he thought that, on consideration, most of the objections had been removed. What the Committee wanted was co-operation in making the exhibition a success—not in that part (which was already secured) to illustrate the uses and economies of gas, but in the engineering part, the plant for which the firms present so well and serviceably manufactured.

Mr. James W. Helps supplemented the Chairman's remarks. Among his points he said the Committee were anxious that no one should be able after the exhibition to say that the labour of the mountain had brought forth nothing but a mouse. Some might say that a series of apartments in which gas was shown doing its best in lighting, cooking, and heating, and so on, was hardly worth the name of a gas-engineering exhibition. The Committee appreciated the fact that it was very hard to ask manufacturers to come to such an exhibition as this on the ordinary terms—to pay a large amount for space, and to keep attendants there for such a long period as six months. They had therefore been going into the matter among themselves and with the authorities of the Franco-British Exhibition, to see whether there could not be some moderation of the terms, and some arrangements come to whereby manufacturers could exhibit on more favourable conditions. The Committee believed that they could, by treating the exhibition on co-operative lines, secure a great reduction below the minimum asked for. If this were done, and manufacturers reconsidered the decision at which many of them had arrived, he felt that they would supply a very instructive adjunct to what the Committee were themselves already doing. It was computed that the exhibition would be attended by something like 40 or 50 millions of people; and anything that would bring together a number of people like this must be attractive from the point of view of the exhibitor. He wanted it to be remembered that a great number of engineers not only of this country, but from foreign parts, would be visiting the show. He had been brought into contact with Continental engineers who were coming over; colonial engineers would also be paying visits; and the members of the Société Technique du Gaz en France would be coming. There would be no need to be ashamed of the suite of apartments furnished in the way he had indicated. What, however, they now wanted was not a series of meters, stoves, and so on (these would be shown in the apartments), but models and working and stationary examples of various machinery made in this country for use in modern gas-works. In emphasizing the various points of the Chairman as to charge for space, attendance, &c., he said it would only be necessary for the exhibiting firms to send attendants when there were special visits; and most of the work could be done by the staff of the Committee. Although it might be said the Committee were late in calling the manufacturers together, he still hoped it would be productive of good. The exhibition was opening on May 11; but anyone who had taken the trouble to visit the exhibition, and see the condition the Engineering Section was in at present, would rightly conclude that it was quite out of the question for it to be ready by May 11. The manufacturing firms had therefore quite sufficient time to come in, and get their stands prepared, if only they would do something to help them. The Committee did not want to force the manufacturers in any way, nor did they suggest force. But they did think it would be to the interest of the manufacturers to help in such an exhibition.

Mr. Jacques Abady (Messrs. Alex. Wright and Co.), Mr. J. L. Cloudsley (Messrs. Parkinson and W. & B. Cowan), Mr. J. R. Phelp (Messrs. George Bray and Co.), Mr. S. J. H. Willey (Messrs. Willey and Co.), and Mr. Donkin (the Bryan Donkin Company, Limited) put various questions to elicit information.

Mr. W. J. Jenkins subsequently remarked that he thought he might say the manufacturers were anxious to assist the Committee to make the section a success; but the difficulty they had met with all along in regard to this exhibition was that they were in a sense out of it. They had to prepare their plant, send it to the exhibition, and instal it; and then these large pieces of machinery could not be sold from there. It was only as a means of advertising that they could come in. One point that had to be carefully considered was the difficulty of watching and attention. That was a great cost in exhibiting. In the case of his firm, they would probably require to have two men there for the period of the exhibition, if they could not get the Committee to take charge of the exhibit. It would run his firm, for two men, into an expenditure of £150; and this, with the addition of hotel expenses, would mean £1 a day for each man. That was a heavy charge when the prospective sale was not very considerable. If, however, the Committee could see their way to get the price for space reduced a little further, and could pay the necessary day-to-day attention, they could send a man down on special occasions to explain the working of the plant; and he, for one, would then be prepared to do what he could. He had, for instance, a coal-breaking plant and a projector in advance of the time they would be required; but these would take up a great deal of space. They had, also, models and photographs of various types of machines.

The price quoted for space [the figure can be obtained probably from Mr. Helps] certain of the speakers still considered too high, in view of the other expenditure to which they would be put; and a price of 2s. per square foot came from one of the manufacturers as a more reasonable figure. But from the Committee side of the table, it was considered that the suggestion was an unreasonable one. Replying to other questions, it was mentioned that special foundations for heavy plant would not be required, as there is a 6-inch concrete floor in the building on virgin soil, over which there had been heavy traffic. As to power, it is the intention of the Committee to have a gas-engine and dynamo for the supply of electricity for motors. It was also stated that no exhibits would be allowed in the exhibition that were not British or French.

Mr. D. Milne Watson supported the speeches made by the Chairman and Mr. Helps. He said the Committee did feel that the manufacturers ought to help them to the extent of showing interesting plant. They would have seen from the "Journal" what gas companies had done, and were doing, in subscribing to show the uses of gas; and the Committee hoped the manufacturers would supplement their efforts by showing that in gas engineering worthy advances had been made.

Mr. Helps here mentioned that he had sent circular letters to seventy firms; and there were several who were not represented at the meeting who asked that they might have general information forwarded to them as to what was done. If he could write and say the meeting were unanimously of opinion that something should be done, it would help the Committee in securing the assistance of others.

Mr. Cloudsley pointed out that the whole thing was quite new to the manufacturers, and that they had not had an opportunity of conferring together.

The Committee at once acted upon the suggestion; and it was agreed that the members should leave the room to the manufacturers for private discussion.

After an interval of about half an hour, the members of the Committee returned; and

Mr. Jenkins said the members of the firms present were desirous of supporting the Committee; but on the conditions that, first, the price of space was not above 2s. per square foot.

The Chairman: I had hoped you would have left that subject to some modification.

Mr. Jenkins: The representatives of the firms said not above 2s.; they did not mind how much it was below. [Laughter.] Another question arose as to the position of exhibitors in the event of a receiver being put in through the exhibition authorities becoming bankrupt. This was not a theoretical matter at all; it had actually occurred in another case. All they wanted was to be reassured on the point.

The Chairman did not think there was much in the point, in view of the men of position connected with the exhibition. He also reminded those present of the large engineering firms who had taken space, and were going to exhibit valuable machinery.

Mr. Jenkins said there was also the question of the price of gas. They understood that the price that was going to be charged by the exhibition authorities was 3s. 9d. per 1000 cubic feet. The manufacturers thought the price should be the same as that charged by the Gaslight and Coke Company or the Brentford Company.

Mr. Helps said he had been in communication with the authorities on this subject. He also thought gas exhibitors had a right to be considered, in respect of gas supply, a little differently from the ordinary consumer.

Mr. Jenkins said another point they wanted to make quite clear about was that the gas would be laid on up to the stands.

Mr. Cundall said, if the exhibitors would erect and fit up their stands, the exhibition authorities would connect them to the main.

Mr. Helps, replying to another question, said they did not want to exclude such things as stoves and meters, but they required something more in the engineering lines.

Mr. Milne Watson and the Chairman both expressed regret that the result of the private conference of the manufacturers had not resulted in a proposition regarding the price of the space that would have given them hope of being able to arrive at a satisfactory basis on which the manufacturers would have come in.

The Chairman's concluding remarks were that those who wished to avail themselves of the opportunity of exhibiting, or those who desired further information, would, he hoped, communicate as early as possible with the Hon. Secretary.

GAS SUPPLY IN ITALY.

On the 4th of last month, the Società Italiana per il Gaz held their annual meeting; and a prosperous year's working was recorded. There has been a notable increase in the demand for gas in the four towns in which the Company are interested, as shown by the following figures:—

	Gas Sold. Cubic Metres.	Increase on 1906. Cubic Metres.	Increase. Per Cent.
Turin	17,898,241	2,371,258	15·3
Bergamo	1,484,096	38,421	2·6
Tortona	381,867	30,576	8·7
Girgenti	184,813	8,364	4·7
Totals	19,949,017	2,448,619	14·0

These satisfactory increases were in face of higher costs of coal and labour. The oft-complained-of deficiency in railway transport in Italy is now apparently being gradually remedied. The price of coke improved, but that of tar diminished. At S. Paolo (Turin), a new gas-holder station has been erected, which is fed by a high-pressure virgin main from the Borgo-Dora works. The number of meters in service on the 31st of December last was 31,413. Improvements in mains and machinery are being effected in the four towns and their gas-works. The Company are also interested in the gas undertaking at Ferrara, from which place an 8 per cent. increase in the sale of gas is reported. At Turin, no new contract with the town authorities has yet been arrived at. The improving results must be gratifying to the Company's General Manager, Sig. Ing. Leonida Spreafico.

EDINBURGH AND LEITH GAS SUPPLY.

The Granton Works—Superannuation Fund—Illuminating Power of the Gas.

Reference has already been made in "Notes from Scotland" to the intention of the Edinburgh and Leith Gas Commissioners to apply to the Secretary for Scotland for a Provisional Order, under the provisions of the Private Legislation Procedure (Scotland) Act, 1899, to authorize them to raise further money for their gas undertaking, extend the time specified for the completion of the Granton works, sanction the establishment of a superannuation fund, and confer additional powers in respect of their gas undertaking. The Draft Order has now been issued; and we take from it the following particulars.

The Order is divided into five parts; (1) Preliminary; (2) finance and borrowing for the redemption of annuities; (3) extension of time for the construction and completion of works; (4) superannuation fund; and (5) miscellaneous. In the first part, it is set forth that, except so far as is otherwise provided, the Order is to take effect from the date of the Act confirming it; that the expression the "City of Edinburgh" means and includes the City and Royal Burgh of Edinburgh within the limits existing at the date of the commencement of the Order; and that the "limits of supply" are the present ones as extended by the Order. The second part confers upon the Commissioners additional borrowing powers to an amount not exceeding £800,000, which is secured on the rates, rents, charges, and other revenues under the provisions of their Acts of 1888 to 1902. The third part extends the time for the completion of the new gas-works at Granton till May 22, 1922, at which date the powers granted by the Act of 1898 in respect of these works are to cease.

Under the provisions contained in the fourth part of the Order, every official and servant in the employment of the Commissioners who shall have completed an aggregate service of ten years, and shall either have become incapable of discharging the duties of his office with efficiency by reason of permanent infirmity of mind or body, or have attained the age of sixty years, shall be entitled, on resigning or otherwise ceasing to hold his office or employment, to receive during life out of the superannuation fund an allowance according to the scale laid down in the Order; and the Commissioners are to have power to add a certain number of years in the cases of the present Chief Engineer and Manager (Mr. W. R. Herring, M.Inst.C.E.), the Clerk (Mr. J. M'Gregor Jack), and Treasurer (Mr. J. S. Gibb). Every official and servant in the employment of the Commissioners at the commencement of the Order, or who shall enter the service thereafter, is to contribute annually for the purposes of this part of the Order 2½ per cent. of his salary or wages. The Commissioners shall, at such date as they may determine in every financial year, contribute out of their revenue a sum equal in amount to the sum which during the same year shall have been paid by the officials and servants. The scheme is not obligatory upon the present employees, provided they give intimation in writing within three months after the confirmation of the Order.

The fifth part of the Order is devoted mainly to the subject of the illuminating power of the gas. It is specified that from the commencement of the Order the prescribed number of candles shall not be less than 14; and when the Commissioners supply gas of the minimum illuminating power authorized, the quality is to be ascertained by test, to be made at the official testing-places to be then provided by the Commissioners at the City Chambers, Edinburgh, and at the Municipal Buildings, Leith. The quality of the gas is to be in all respects in accordance with the provisions of the Gas-Works Clauses Act, 1871. For testing the illuminating power, the No. 2 "Metropolitan" argand burner is to be employed in conjunction with either the bar or the table photometer, with the Harcourt 10-candle pentane lamp as the standard; and in making the test the burner is to be so used as to obtain from the gas the greatest amount of light. No penalty is to be incurred for insufficiency of pressure, deficient illuminating power, or excess of impurity in the gas when these defects arise from circumstances beyond the control of the Commissioners. The limits of supply under the Order are to include the parishes of Currie, Ratho, and Newton, in the county of Midlothian, and Kirkliston, in that county and in Linlithgow. The Commissioners are authorized to charge differential prices for gas, allow discounts, interrupt the supply for the purpose of making alterations or repairs in the pipes, amalgamate the offices of Treasurer and Collector, appoint the same person to both, and contribute to the employees' sick benefit society.

DRAYCOTT AND LONG EATON GAS SUPPLY.

The Draycott Company's Victory.

An Extraordinary Meeting of the Draycott Gas Company was held at the offices last Thursday, for the purpose of considering the Company's Bill as passed by the House of Commons.

Mr. J. N. DERBYSHIRE, the Chairman of the Company, presided, and moved a resolution adopting the Bill, subject to such alterations as may be made by Parliament and be approved by the Directors. In doing so, he first referred to the recent proceedings before the Select Committee of the House of Commons, and then went on to explain the position occupied by the Company in the district. He said that when the Draycott Act was obtained in 1888 the Long Eaton Gas Company had powers to supply Draycott and Breaston; but they declined to avail themselves of them, and allowed the Draycott Company to supply without opposition of any kind. Under these circumstances, one would have expected that the district would naturally become vested in the Draycott Company; but in the Act of 1888 no clause was inserted cancelling the Long Eaton powers. Those who were responsible for the conduct of the Company in those days evidently did not think it worth their while to put in such a clause, as it seemed entirely out of the question that the Long Eaton Company would ever dream of entering the district. However, the unexpected happened; but not until 1907—nearly twenty years after the Draycott Company had been formed, and when it had become a strong and prosperous undertaking. Not only did the Long Eaton Company then take their mains right through the district, but they commenced a fierce competition by offering to supply gas at 35 per cent. below the price they were charging in Long Eaton itself. They also offered free installations and many other inducements to customers. But this attack had availed them nothing; for the Draycott Company's customers had, on the whole, remained with them, and not gone over to the invaders. The only thing the Company could do was to promote a Bill to cancel the Long Eaton powers; and this was the Bill which was before the meeting, and which it was hoped would shortly become an Act. The preamble set forth that the Long Eaton Company had recently laid mains in the area of supply of the Draycott Company, and were charging a lower price for gas than that charged by the latter Company; that thereby, and in other ways, they were unfairly and improperly competing with that Company; and that it was therefore expedient that the Long Eaton Gas Act of 1901, and the powers thereby conferred upon the Long Eaton Company, should be repealed, amended, or varied. This preamble was considered proved by the Select Committee of the House of Commons; and by clause 4 it was ordered as follows: "That from and after the passing of this Act all powers, rights, authorities, and privileges of or belonging to the Long Eaton Company under the Long Eaton Gas Act of 1901 relating to the supply of gas within the parishes and parts of parishes hereinafter mentioned in the county of Derby shall absolutely cease and determine." This was a very important clause for the Draycott Company, and the way in which it was to be carried out was set forth in a further clause at the end of the Bill, which stated that "the Long Eaton Company shall, within three months after the passing of this Act, take up and remove all gas mains, pipes, and apparatus belonging to them within the area referred to." This was the present position of affairs. The Bill would shortly be going up to the House of Lords, and as soon as the Royal Assent had been obtained to it, the period of three months for removing the pipes would begin. The only material alteration made in the Bill as deposited was that a small part of the Company's original district on the east side of Breaston was transferred to the Long Eaton Company; but this area had never been supplied by them, and they were quite willing that Long Eaton should have it. The Bill, however, preserved to the Draycott Company every customer within their district; not a single one would be lost. The moment their pipes came alongside, Long Eaton's power to supply would absolutely cease. He thought the shareholders would agree with him that this was a very satisfactory termination to the fight in the House of Commons. During the struggle, there had been an abnormal reduction in the price of gas, and the future price would have to be carefully considered. The Directors were most desirous to keep the price down to the lowest possible figure. During the whole course of the Company's history, there had never been an increased price list issued; and the Board would very much like not to break such a record. If, however, they had to break it, they would make the increase as small as possible.

The motion was carried unanimously.

MANCHESTER GAS SUPPLY.

The Past Year's Progress—Estimates for 1908-9.

In the year ended the 31st ult., the total income of the Gas Department of the Manchester Corporation was £782,513, and the expenditure £726,640; leaving an actual surplus of £55,873, compared with an estimated surplus of £20,677, which has enabled the Gas Committee to pay over £50,000 to the city fund for the relief of the rates during the year without encroaching upon the reserve fund, which, according to the last balance-sheet, stood at £50,240. This very satisfactory state of things has been brought about by increased business and the excellent results obtained by the sales of coke. The Committee added 4877 new consumers to their books during the year; and the output of gas increased by nearly 4 per cent.

Having regard to the increased cost of coal, the estimates for the year ending March 31, 1909, which were approved by the Gas Committee last Wednesday, show a surplus of £20,774 only; but the Committee nevertheless decided, rather than increase the price of gas, to pay the usual contribution of £50,000 to the city fund by making up any deficiency in the realized surplus out of the reserve fund, which was practically untouched during the past year. It was pointed out that if the Committee had to pay a still higher price for coal when they next went into the market, it would be impossible to avoid an increase in the price of gas in the year ending March 31, 1910, if the annual contribution of £50,000 to the relief of the rates was to be continued.

Gas Exhibition at Wicklow.—Under the auspices of the local Gas Company, an attractive exhibition of gas cooking, heating, and lighting appliances has lately been held in the Assembly Hall, Wicklow. Messrs. John Wright and Co. furnished a good show of cookers, grillers, boilers, gas fires, radiators, and gas-irons; and demonstrations in the use of the cookers were given daily by Miss Myles. The lighting portion of the exhibition was undertaken by the Gas Company, and was a highly effective display. Some excellent designs in gas fittings, globes, and burners were supplied by the New Inverted Incandescent Gas-Lamp Company, Limited, and Messrs. George Bray and Co., Limited; and the Pneumatic Gas Lighter Company and the Telephos Company showed in operation their methods of automatically lighting and extinguishing lamps. The exhibition was admirably carried out by Mr. J. F. Tyndall, the Gas Company's Manager.

REVERTING TO GAS AT ACTON.

A Striking Saving.

The Acton Urban District Council have devoted two meetings recently to considering the estimates for the new rate; and as one result of the praiseworthy efforts made to effect economies, the public lighting which is now carried out by the municipal electricity undertaking is to be again placed with the Brentford Gas Company.

At the first meeting, the Chairman (Mr. H. S. Schultess Young), in making his "budget speech," pointed out that the rate had to be made to fit the estimates, and not the estimates to fit the rate. The different Committees had sent in suggestions for the purpose of cutting down the estimates; but he did not think they would be found altogether sufficient. In dealing with the various directions in which economy might be effected, he said that in the Electricity Department there were various methods of cutting down the expenses. By simply reverting to gas for the street lighting, the Council could save at least £1000. The present cost of lighting the streets by electricity was no less than £1780. For providing burners, lamps, &c., and lighting and keeping in a state of efficiency 65 lamps in the main roads, the charge of the Brentford Gas Company would be £6 3s. 4d. each lamp per annum. This would mean £400 per annum, *plus* £200 loan charges which had to be paid on the electricity undertaking, as against £1780 for electricity. As to the efficiency of the electricity supplied, from an official report which he had in his hand, it appeared that the average power of the 60-candle gas-lamp was no less than 69 candles; while the electric arcs of a nominal 1000-candle power only reached 736 candles when tested—this, too, on notice to the Electrical Engineer that the tests were to be made. Street lighting by electricity in Acton was a wasteful and inefficient scheme. He quoted different statistics and reports, showing that the average cost of street lighting by electricity was about £700 per mile; while for gas it was only £91, or, with equal candle power to electricity, about double that figure. In Liverpool, out of 451¼ miles of streets, 436 miles were lighted by incandescent gas, 5½ miles by electricity, and 9¾ miles by flat-flame gas-burners; so that it did not seem the Corporation were particularly fond of street lighting by electricity.

Mr. Eydmann moved that the High Street, Churchfield Road, Market Place, and Church Road be lit by gas on exactly the same basis as before the installation of the electric light, and that arrangements be made with the Brentford Gas Company accordingly. He said that when the main road was lit by gas in former years, it was regarded as the best lit road by gas outside London. Acton could not afford the luxury of lighting the main roads by electricity. Mr. Page seconded; remarking that he had previously moved a similar resolution, and that it was recognized incandescent gas penetrated fog better than electric light. Mr. Monson said he was one who had felt that, because Acton lay between the electrically lighted districts of Hammersmith and Ealing, it should also be lighted by electricity; but if the Gas Company were prepared to do it for the price which had been named, he thought it would be better to go back to gas. A reduced candle power would result from the use of gas; but in some places he thought there was more light than necessary. If the Metropolitan Electricity Supply Company would not allow the Council to have electricity at a lower rate, then the Council should revert to gas. He thought, however, that they must have a firm offer from the Gas Company as to what they would do.

Electricity found a supporter in Mr. Poulton, who thought it would be a great pity for the Council to go back to gas, at least until they had had the advice of their expert. He urged that if half the present electric standards were dispensed with, there would be sufficient light, and the cost would be reduced to £890 per annum; and further reductions could be made by shutting them off at a quarter past eleven, instead of one o'clock as at present. Mr. Dunsmore said that electricity was not dearer than gas—it was cheaper. At the present time no one could deny that the electric lighting of the streets was dearer than the gas lighting of the same streets. But the conditions in Acton were of an entirely exceptional character; and though they were in the throes, apparently, of financial ill-luck, they hoped, with the help of the expert, to go forward to that happy time when the Council would be very glad they had retained this undertaking. It was extremely undesirable to adopt the course advocated by the Chairman, seeing what an important part the public lighting would play in the finances of the undertaking by raising the price all round per unit. Mr. Peat also thought it would be an unwise change, as the saving would be so small. He doubted whether they would get a better light; and he thought if the suggestions of discontinuing the use of every alternate lamp and shutting the lights down earlier were adopted, they might get the roads lighted at a reasonable price. Mr. Shillaker said if they reverted to gas, they would place themselves in the hands of a Company whom they had to be always harrying to keep them "up to the scratch" with regard to the luminosity of the gas supplied; but the Chairman remarked that, as business men, it was to the interest of the Company to keep up to the mark. Mr. Baldwin said he was never in favour of electricity in the main streets; but he thought it would make them look ridiculous to go back to gas now.

Mr. Hunt then moved, as an amendment, that the Clerk be instructed to ascertain the price, terms, and considerations upon which the Brentford Gas Company would light the High Street, Churchfield Road, Market Place, and Church Road, with an estimated number of ninety lamps; and this was agreed to, after some further discussion, in the course of which Mr. Eydmann complained bitterly about the character of the lighting of the main road, and said Acton's electric lighting was the worst in England. After this outspoken comment, the Council rose.

A few days later the members met again, when the Chairman again brought forward his proposed reduction in the estimates. He said the ratepayers were very carefully watching all that they were doing, and anxiously awaiting the result of their deliberations. As regarded the street lighting by gas, he had spent several hours with the Manager of the Gas Company (Mr. Alex. A. Johnston), who had agreed to undertake the street lighting on even more favourable terms than before. In addition to the Company paying £500 for reinstating the incandescent lamps, they would supply the 300-candle power lamps as before, increase the efficiency of the 60-candle power lamps to 80-candle power, and, without charge to the Council, affix 1200-candle power lamps on the two standards in the main road at each extremity of the parish, supply columns and burners, maintain all these, and provide gas, mantles, and attendance for £489 per annum, instead of £1780 as at present paid for electricity. If they liked, alternatively, to have every second lamp turned out in the summer months, it would cost £45 less. As to the dissent exhibited by Mr. Poulton and Mr. Shillaker, he could only say he would be ashamed to face the ratepayers if he did not vote for so generous an offer, which did not even bind the Council to any term of years, and effected, with better lighting, a net saving of no less than £1135 per annum for the parish. He proposed that the offer of the Gas Company be accepted, and that the Company be forthwith directed to carry it into effect. Mr. Hunt seconded the motion, remarking that the Council had now been given an entirely free hand to take the gas for any period they liked.

The Chairman of the Electricity Committee (Mr. Dunsmore) said that to cut off the public lighting would be a serious blow to the electricity undertaking. He felt sure that, as soon as the expert had reported upon the matter, they would be able to reduce the cost of lighting the streets in a satisfactory way. He was not in favour of the present exorbitant price; he thought it ought not to be more than one-half. They knew that, once the Council reverted to the old method of lighting the streets by gas, there was no likelihood in the life of the present Council of going back to electricity. Whether they reverted to gas or not, there was a capital charge of £200 on the electricity undertaking which had to be paid annually. If the Council went on the lines proposed by the Chairman, he predicted that the aftermath at the end of the ensuing year would be a position of difficulty from which they would not be able to extricate themselves. By adopting the methods proposed by certain members, of putting out the lamps earlier and rearranging them, and by adopting the Crompton-Blondel lamps, of which they had at present four, the Council could save £1000 without having anything to do with the Gas Company. He quoted figures to show how, by altering the method of lighting, the cost could be reduced to £750, as against £480 for an inadequate gas-light.

After some further discussion (during which Mr. Eydmann said he put no faith in the figures of Mr. Dunsmore, if they came from the Electricity Department), the motion for the acceptance of the Gas Company's offer was carried.

It was reported that on Friday night (the Council having decided to switch off the electric light and revert to gas) for some reason or another the lamps were not lighted; and the only illumination in the principal streets was that from the passing electric tramway-cars. At South Acton, somebody placed several wax candles in ginger-beer bottles, and hung them from the standards, with the words, "We will have light." It is said that the police complained of being greatly hampered, and that several residents have sent letters of protest to the Local Government Board.

FINANCES AT ROCHDALE.

An increase of twopence is foreshadowed in the rates this year at Rochdale. In several directions there are increased demands upon the Finance Committee; and the gas profits are several thousand pounds less than was the case a year ago. On the tramways there is a deficit of £4048, and on the water-works of £2042.

The advance in the price of coal has naturally affected to a considerable extent the gas profits; and the surplus on the present occasion is only £10,997, as compared with £16,326 a year ago, or a reduction of £5329. Two years since there was a profit of £17,692; in 1905, it was £19,598; and in 1904, £13,000. The amount of this year's profit which the Gas Committee are to allocate to the relief of the rates is £10,000; leaving £997 to be placed to the reserve fund, which now stands at £7897. During the financial year just ended, the total receipts of the Gas Department were £88,801, or £5320 more than in the preceding year; while the expenditure was £77,803, or an increase of £10,649. On the expenditure side, the cost of coal and carbonizing was £8346 more than in the previous year; purifying cost £536 more; repairs an additional £670; and stokers' wages an increase of £597 (£6553, against £5956).

The year's working of the electricity undertaking shows a profit of £4129, or £6 less than was the case twelve months ago. Of this amount, the Finance Committee recommend that £1129 be placed to the reserve fund, and that the balance of £3000 be devoted to rate relief. A year ago £2000 was paid out of the electricity profits to the relief of the rates; while in 1906-7 the amount devoted to this purpose was £2350. The reserve fund now stands at £4299, without the addition of this year's proposed contribution. The total income of the department last year was £20,378, or £3092 more than in 1907-8. The expenditure was £11,014, or an increase of £2552. This left a gross profit of £9361, as compared with £8224 twelve months ago; and after paying interest, sinking fund, and other standing charges, the net surplus was £4129. Coal cost £5776 last year, which was £1872 more than in the previous year.

As to the water-works, it was anticipated that the deficiency to be rated for this year would be at least £1000 less than last year; but, owing to the wet summer, the amount is only £646 smaller than a year ago. Last year's deficit that had to be rated for was £2688; while this year the amount required will be £2042. Generally speaking, however, the department continues to show satisfactory expansion. The rentals from domestic supplies totalled £31,718, as compared with £31,226 a year ago, or an increase of £492; and the customers have increased by 279—from 30,851 to 31,130. The revenue from trade supplies was £11,331, against £11,335. Had it not been for the wet summer, it is calculated that an increased revenue of from £400 to £600 would have been received from trade supplies.

ABERTILLERY ELECTRICITY SCHEME.

Local Government Board Suggest Gas.

The Abertillery Urban District Council at their last meeting had read to them by the Clerk (Mr. W. Gait) a letter from the Local Government Board, stating that the Board were not satisfied, upon the information before them, that the establishment of an electric lighting installation in accordance with a proposed scheme would be successful from a financial point of view. They observed that the revenue from private lighting was based on an estimate of 6s. per 8-candle power lamp per annum; but, looking to the fact that the area to be supplied was composed almost entirely of houses of very low rateable value, the Board had considerable doubts as to whether this high estimate would be realized. As at present advised, it appeared to the Board that an average revenue of 4s. per 8-candle power lamp would be a safer estimate. The Board estimated that there would be a net annual deficiency of between £300 and £400; and consequently they asked whether it would not be more economical to adopt a scheme for lighting the area by gas, somewhat on the lines indicated by Mr. Thomas Canning in a report to the Council dated last October.

The Council decided to ask the Local Government Board to receive a deputation, with a view to inducing the Board to reconsider their attitude towards the scheme, and also to ascertain whether, in the event of the Council adopting a scheme for the lighting of the southern portion of their district by gas, the Board would protect the Council from any competition by an electric lighting company.

SLOUGH COUNCIL AND THE WATER BILL.

At their last Monthly Meeting, the Slough Urban District Council had before them a report by their Parliamentary Agents (Messrs. Baker and Co.) regarding the recent proceedings which resulted in the Bill for the purchase of the Water Company's undertaking being rejected by a House of Commons Committee. In a letter accompanying the report, Messrs. Baker and Co. advised the Council to call a meeting under the Borough Funds Act, and to pass thereat a resolution to re-deposit the Bill next session. The Council went into committee to consider the question of future procedure.

After reviewing the arguments of Counsel both for and against the Bill (as reported in the "JOURNAL" for March 31, p. 841, and April 7, p. 39), and referring to the Company's contention that the ratepayers had been misled by the explanation of the Bill given to them at the public meeting when its promotion was approved of, the report continued: "The Committee having announced that if the Council 'were willing to try to come to terms with the Company they would be disposed to give the Council the Bill,' they proceeded to indicate that very generous terms should be given to the Company, and went so far as to suggest what these terms should be. They then adjourned for some days, to enable an attempt at a settlement to be made. The Council at once showed the greatest willingness 'to try and come to terms with the Company.' The Company, however, were only willing to settle on terms so extravagant that the Council could not accept them. They declined any interview with the Council; and the attempts at a settlement are those contained in letters. Those written by the Company were 'without prejudice;' while those written by the Council were 'open letters.' When the Committee met, the Council asked to be allowed to show that they had brought themselves within the terms of the Committee's decision—*i.e.*, had been willing 'to try to come to terms.' But the Committee now refused to hear them on this matter, and said that unless an agreement had in fact been arrived at, they could not pass the Bill. They declined to inquire into the conduct of either Council or Company; and would not consider whether the Company had made an agreement impossible by making the acceptance of an extravagant figure a *sine quâ non* of agreement. 'We are not,' the Committee now said, 'going to act as arbitrators and determine the price;' and they rejected the Bill. . . . It is, without doubt, a matter of great regret that the Committee should have rejected the Bill; but it would have been more regrettable if the Council had been weak enough to agree to an unreasonable price in order to obtain the legislation to which precedent and policy entitled, and entitles, them. The Committee, no doubt, made many endeavours to compel a settlement; but though at one time they proceeded to act as arbitrators, they finally shrank from that position. It would have been better if (in accordance with common practice) they had confined themselves to principle, and left all questions of price to be determined by an arbitrator in the usual way."

The Chairman of the Council (Mr. F. Farr) remarked that they were in the unfortunate position of not being able to disclose the figures, as when they tried to bring them before the House of Commons Committee to show on what the Council's offer was based, they were told that the correspondence on behalf of the Company was conducted without prejudice, and that therefore they were not entitled to publish the figures. There were, however, one or two matters he would like to touch upon, though perhaps they were of a personal character. It happened to be during his year of office that the question of the purchase of the water-works undertaking was brought prominently to the notice of the Council by the ratepayers of Slough; and to put the matter on a proper footing and keep it in order, it was necessary for the Council to hold a public meeting of ratepayers to confirm what the Council had done. At that meeting he occupied the chair, and put (in what he considered a fair and reasonable manner) proposals which had been made and agreed to by the Council. There was no desire whatever on his part to exaggerate or try in any way to create a false impression in the minds of those present or the ratepayers of Slough at large. He had certain information to go upon; and this information was given to the public in a fair and reasonable spirit. There was no intention on his part to deceive anyone. They knew now that the statement was not quite correct; and in the course of a very stiff examination by clever Counsel, several of the remarks he made at the meeting were somewhat pulled to pieces. In justice to himself, he ought to say that, though a request was put in the Bill for the purchase price to extend over 100 years, it was stated that the Council did not expect to get this term allowed; and he qualified his speech by saying that this would be subject to the consent of the Local Government Board and the approval of the House of Commons Committee if the Bill passed. With regard to the back-dividends, there was undoubtedly some little misconception. It was all along felt by those who had considered the matter that if there were a certain amount of back-dividends, they would have to be met in the way of purchase price; but the question the Council raised was that the Directors were not in a position to prove that there were back-dividends due to them, because for 24 years there had been no accounts filed by the Company, and it was impossible for anyone to say until he had seen the accounts whether there were £9000 or £19,000 due for back-dividends. They did hear before the Committee that they amounted to £19,000; and the sum had now increased to £24,000 without any proof. It was unfortunate the Council had to appear before a Committee whose Chairman was not favourably inclined towards their suggestions, though one did not like to say too much on this point. No one regretted the failure of the town to acquire the water-works more than he did himself. They all felt that in proceeding with the matter they were doing something which in the future would be a great advantage to the town and the ratepayers at large. At the request of the Chairman of the Committee (as he put it, in the interests of peace), the Council made an offer to the Company; and he could only say he was glad the Company did not accept the offer, because he believed the town would have had to pay far too much for the undertaking. He thought they had better face the expense they had incurred for the present; and perhaps at some future time they could apply to Parliament with a stronger case.

Mr. Darvill said he thought the Council ought to exonerate the Chairman from the imputations cast on him by Counsel, that he intentionally tried to mislead the ratepayers. He was sure Mr. Farr put the matter before the ratepayers in a fair way, and had not the slightest wish to mislead a single ratepayer. He thought they ought to show their confidence in the Chairman, because the cross-examination by the Company's Counsel was most unfair. Several other councillors also expressed their conviction that the Chairman had no intention whatever of misleading anyone.

COVENTRY CORPORATION WATER SUPPLY.

The Auxiliary Supply from Birmingham.

Steady progress is being made with the construction of the new water-main from the Shustoke reservoir of the Birmingham Corporation to Coventry. During the last few weeks, considerable lengths of pipes have been laid; and four gangs of men are now engaged working on different sections of the route. On Sunday, the 19th inst., the connection of the new 16-inch cast-iron main was made with the existing 18-inch main supplying the city from the Coundon reservoirs. This work was one of some difficulty, and caused considerable anxiety to the Water Engineer (Mr. J. E. Swindlehurst), owing to the necessity of breaking the existing main-pipe connection, and at the same time interfering as little as possible with the water supply to the city. How successfully this work was carried out may be inferred from the fact that possibly no householder was aware that anything of so important a nature was in progress; the water in the pipes having been maintained at a steady pressure during the whole time, notwithstanding the severance of the trunk main. This was apparently effected by a very careful use of the pumping plant at Whitley and Spon End; the supply of water pumped into the mains being just sufficient to meet the demands of householders throughout the varying consumption of each hour. The pumping-stations and works were kept in touch by means of the telephone, and the supply was regulated as required, with the result that a constant pressure was maintained. It is confidently expected that the new main will be completed by the early part of June; and it will be a welcome addition to the plant, as, owing to the rapid increase in the number of houses and works in the city, the demand upon the Water Department is so great during a dry season as to leave little, if any, margin of supply, even allowing for the increased daily yield from the wells which has been obtained as the result of Mr. Swindlehurst's foresight. About eleven miles of the new 16-inch and 20-inch main have now been laid, leaving two miles to be constructed, together with a subway under the Midland Railway at Shustoke, which is in progress.

A Gas Company's Trench and an Accident.

An inquest was held some days ago at the Dorking Cottage Hospital on the body of George Young, a carman, who died as the result of an accident. It appeared from the evidence that a trench had been opened across the roadway for the purposes of the Gas Company, leaving a space of only 2 feet and the footpath on which to pass by. As a pantechnicon, which deceased accompanied, went on to the footpath, and the wheels stuck in a heap of mud. Deceased then trod on a stone, which rolled, and caused him to fall beneath the horse, the wheels of the van afterwards passing over him. His right leg was fractured, and he sustained other hurt. Dr. Clark said the injuries became gangrenous, and death resulted. The Coroner (Mr. G. F. Roumieu) remarked that the accident undoubtedly arose owing to the state of the road, and he could not understand a local authority allowing such a condition of things to exist. Mr. Carpenter, jun., Assistant Manager to the Gas Company, explained that it was not possible to do the work over half the road at a time. The Jury, in returning a verdict of "Accidental death," expressed the opinion that there was negligence on the part of the Gas Company in breaking up the road in the way they did. The Coroner was requested to communicate with both the Gas Company and the Dorking Rural District Council on the matter.

CROYDON CORPORATION WATER SUPPLY.

Proposed Adoption of the Ozone System of Purification.

The Croydon County Council at their last meeting considered a water-purification scheme brought forward by the Water Committee, who have been giving attention to the question of sterilizing the Addington supply by the ozone process, in lieu of sand filtration. The Committee recommended the erection of plant according to the De Frise system, at an estimated cost of £8350 (including £750 for the reconstruction of a main), compared with £9000 sanctioned by the Council for sand filters. A joint report by the Chairman of the Committee, the Borough Engineer (Mr. G. F. Carter, M.Inst.C.E.), and the Medical Officer of Health (Dr. H. M. Richards) on the subject was presented, giving their observations as the result of an inspection by them of the system as in operation at the St. Maur Water-Works in Paris. The process is to take advantage of the principle that ozone in water destroys bacteria; but as it is only slightly soluble in water, any excess has to be removed on account of a peculiar taste it imparts. This is provided for in the plant. Air is admitted, dried by means of chloride of calcium, and passed along to the ozonizers, which are placed in a dark room. After leaving them, the air is forced by a compressor along with the water into the sterilizers, which consist of cast-iron vertical cylinders enamelled inside. They are built up of sections each 20 inches high, between the flanges of which are fitted horizontal celluloid diaphragms perforated with a number of small holes. The water and the ozonized air, introduced in the lowest compartment, ascend together to near the top of the sterilizer, being intimately mixed at the passage of each diaphragm. The sterilized water passes away near the top, and the surplus air is led back to the bottom of the sterilizer for use again. There would seem to be no doubt, the reporters said, that ozone is a reliable sterilizer of polluted water, and that the process is particularly applicable to those supplies where the pollution is bacteriological rather than chemical. It was suggested that a substantial unit of the plant should be installed at Croydon at the patentee's risk, and subject to well-defined conditions, so that a sufficient trial of it might be made. The readiness to treat water immediately when called upon was regarded as a valuable characteristic. The estimated annual cost of the working of the plant recommended was £210. After considerable discussion, the subject was referred back to the Committee for further consideration and report.

Successful Tunnelling at Lake Vyrnwy.—After operations lasting six years, the tunnel from the River Marchnant to Lake Vyrnwy has been successfully driven through. The tunnel, by which the River Marchnant will be diverted into Lake Vyrnwy, is 7 feet in diameter and nearly 1½ miles in length, and it has been driven from the two ends without any intermediate shaft. A length of 3700 feet was driven from the inlet end; and the work on that side was then suspended, as, owing to the presence of water, it was costing more than the driving from the outlet end. The miners on the outlet side pierced through to the inlet side last Thursday week; and the centre lines met perfectly. The hills through which the tunnel has been driven rise to a height of 1340 feet above sea level. The invert of the tunnel at the Vyrnwy end is level with the top-water line of the lake.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

In the Falkirk Town Council this week, the Gas Committee reported that the Gas Manager recommended that an electrically driven cage hoist be erected, to work in conjunction with the side-tipping trucks, for elevating the coke to the coke-hoppers, and that a revolving riddle be also obtained. The estimated cost of these is £330. It was also reported that a letter had been received from the Clerk to the Eastern District Committee of the County Council of Stirling regarding the extension of the Corporation gas-main to North Broomage and Stirling Road, and stating that if the main were laid the District Committee would undertake to put up street-lamps on the route. The Committee agreed to recommend the Town Council to lay the main, at an estimated cost of £370. Both proposals were carried.

The estimates for the lighting of Edinburgh during the forthcoming year were before the Cleaning and Lighting Committee of the Town Council on Monday. They show an expenditure of £48,485, and a revenue of £20, leaving to be provided for out of the rates £48,465, as compared with an estimate of £45,800, and an actual expenditure of £45,594 during 1907-08.

It was reported to the Arbroath Town Council last week that the Manager had, as authorized by the Gas Committee, purchased a sufficient quantity of coal for the requirements of the gas-works till the end of March, at a reduction of about 2s. per ton, as compared with the prices at which coal had been contracted for in May last, and that the Committee had empowered the Manager and the Convener to purchase a further quantity, sufficient to carry on the works till the end of April. Tenders had been received for coal for the ensuing year, and had been tabulated; and the prices for the same coal during the years 1905, 1906, and 1907 had also been tabulated as far as possible. Inasmuch as the general reduction in prices averaged only from 1s. to 1s. 6d. per ton, the Committee found that it was difficult to decide whether the Corporation should settle at once or delay in the hope of a further fall in the price of coal. In the whole circumstances, however, the Manager and the Convener recommended that certain tenders should be accepted. This was approved of by the Council. The tender of Messrs. R. Laidlaw and Sons, Limited, of Glasgow, for cast-iron pipes and connections, being the lowest, was accepted.

The Gas Committee of the Dundee Town Council had under consideration on Wednesday the subject of what changes should be made in the arrangements for carrying on the work of the City, in view of the disclosures following the recent theft of money from the strong room in the Gas Office. After considerable deliberation, it was resolved to recommend the Council that the office of Police and Water Treasurer be disjoined from that of Gas Treasurer and City Chamberlain, and that the offices of Gas Treasurer and City Chamberlain be merged in one official, the post to be advertised. There was a discussion as to whether the evidence which was heard before a Committee of the Council regarding the administration of the Gas Office should be submitted to the Council; and it was decided not to do so.

The Denny Town Council at their last meeting received a recommendation from the Gas Committee to proceed with the erection at the gas-works of a show-room and meter store, at a cost of £103. After a discussion, the proposal of the Committee was agreed to.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 211.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Apl. 10	10	**Alliance & Dublin** 10 p.c.	19½—20½	..	4 17 7
268,324	*10	,,	7	Do. 7 p.c.	13½—14½	..	4 13 4
310,000	Stk.	Jan. 16	4	Do. 4 p.c. Deb.	100—103	..	3 17 8
200,000	5	Oct. 30	6½†	**Bombay, Ltd.**	6½—6¾	..	4 16 4
40,000	5	,,	6½†	Do. New, £4 paid	4½—5	..	5 4 0
50,000	10	Feb. 27	14	**Bourne-mouth Gas and Water** } B 7 p.c.	27—28	..	5 0 0
51,810	10	,,	7		16½—16⅝	..	4 3 7
53,200	10	,,	6	} Pref. 6 p.c.	14—15	..	4 0 0
380,000	Stk.	,,	12½	**Brentford Consolidated**	242—247	..	5 1 3
300,000	,,	,,	9⅜	Do. New	180—185	..	5 2 8
50,000	,,	,,	5	Do. 5 p.c. Pref.	118—123	..	4 1 4
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	100—105	..	3 16 2
220,000	Stk.	Mch. 12	11½	**Brighton & Hove Orig.**	195—205	..	5 9 9
246,320	,,	,,	8½	Do. A. Ord. Stk.	152—157	..	5 5 1
460,000	20	Mch. 27	10	**British**	41⅜—42½	..	4 15 1
104,000	Stk.	Feb. 13	6	**Bromley, Ord. 5 p.c.**	116—119	..	5 0 10
165,700	,,	,,	4½	Do. do. 3½ p.c.	86—89	..	5 1 2
500,000	10	Oct. 11	7	**Buenos Ayres (New) Ltd.**	11⅛—12	..	5 16 8
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
150,000	20	Mch. 12	7½	**Cagliari, Ltd.**	25—26	..	5 11 6
100,000	10	—	—	**Cape Town & Dis., Ltd.**	4—6	..	—
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.	7—9	..	5 0 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	48—50	..	6 0 0
103,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	92—94	..	4 15 9
157,150	Stk.	Feb. 27	5	**Chester** 5 p.c. Ord.	105½—107½	..	4 13 0
1,493,280	Stk.	Mch. 12	5⅝	**Commercial** 4 p.c Stk.	104—109	..	4 15 5
560,000	,,	,,	5	Do. 3½ p.c. do.	100—105	..	4 15 3
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	82—84	..	3 11 5
800,000	Stk.	,,	6½	**Continental Union, Ltd.**	115—120	..	5 8 4
200,000	,,	,,	7	Do. 7 p.c. Pref.	140—145	..	4 16 7
460,170	Stk.	—	5½	**Derby Con. Stk.**	122—123	..	4 9 5
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
148,995	,,	Mch. 31	5	**East Hull** 5 p.c. Ord.	100—103	..	4 18 7
486,090	10	Jan. 30	12	**European, Ltd.**	23—24	..	5 0 0
354,060	10	,,	12	Do. £7 10s. paid	16½—17½	..	5 2 10
15,182,590	Stk.	Feb. 13	4⅛	**Gas-light and Coke** } 4 p.c. Ord.	94—96	−2	4 11 8
2,600,000	,,	,,	3⅜		3½ p.c. max.	87—90	..
3,799,735	,,	,,	4		4 p.c. Con. Pref.	106—109	..
4,193,975	,,	Dec. 13	3		3 p.c. Con. Deb.	83—85	..
258,740	Stk.	Mch. 12	5	**Hastings & St. L.** 3½ p.c.	93—93	..	3 15 0
82,500	,,	,,	6½	Do. do. 5 p.c.	112—115	..	5 13 1
70,000	10	Oct. 11	11	**Hongkong & China, Ltd.**	19—20	..	5 10 0
4,940,000	Stk.	Nov. 14	8	**Imperial Continental**	179—181	..	4 8 5
473,600	Stk.	Feb. 13	3½	Do. 3½ p.c. Deb. Red.	93—95	..	3 13 8
195,242	Stk.	Mch. 12	6	**Lea Bridge Ord.** 5 p.c.	113—118	..	5 1 8
561,000	Stk.	Feb. 27	10	**Liverpool United A**	227—229	+6	4 7 4
718,100	,,	,,	7	Do. B	162—164	+½	4 5 4
306,083	,,	Dec. 30	4	Do. Deb. Stk.	106—108	..	3 14 1
152,736	Stk.	Feb. 13	7⅛	**Maidstone** 5 p.c.	136—141	..	5 8 2
75,000	5	Nov. 28	5	**Malta & Medn., Ltd.**	4¼—4⅝	..	5 5 3
560,000	100	Apl. 1	5	**Melbourne** } Met. of 5 p.c. Deb.	102—102	..	4 18 0
250,000	100	,,	4½	} 4½ p.c. Deb.	99—101	..	4 9 1
541,920	20	Nov. 14	3½	**Monte Video, Ltd.**	10½—11½	..	6 1 9
1,775,892	Stk.	Feb. 27	4⅝	**Newc'tle & G'tesh'd Con.**	106—107	..	4 6 5
418,462	Stk.	Dec. 31	3⅜	Do. 3⅜ p.c. Deb.	88—90	+2	3 17 9
15,000	10	Feb. 27	10	**North Middlesex** 10 p.c.	20—21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13½—14½	..	4 16 7
300,000	Stk.	Nov. 28	7†	**Oriental, Ltd.**	142—145	..	4 16 7
60,000	5	Mch. 27	7	**Ottoman, Ltd.**	6—6⅜	..	5 7 8
398,490	5	Oct. 30	7	**Primitiva Ord.**	6⅛—7	..	5 0 0
796,980	5	Jan. 30	5	Do. 5 p.c. Pref.	4⅝—5⅜	..	4 17 7
488,900	100	Dec. 2	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
1,000,000	10	Oct. 11	8	**River Plate Ord.**	13¾—14⅛	+⅛	5 14 1
312,650	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
250,000	10	Apl. 10	8	**San Paulo, Ltd.**	13⅜—14	..	5 14 4
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	50—52	..	4 16 2
135,000	Stk.	Mch. 12	10	**Sheffield A**	244—246	..	4 1 4
209,984	,,	,,	10	Do. B	244—246	..	4 1 4
523,500	,,	,,	10	Do. C	244—246	..	4 1 4
70,000	10	Nov. 14	10	**South African**	14½—15½	..	6 9 0
6,429,895	Stk.	Feb. 13	5½	**South Met., 4 p.c. Ord.**	121—123	..	4 6 8
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	83—85	..	3 10 7
209,820	Stk	Mch. 12	8	**South Shields Con. Stk.**	154—156	..	5 2 7
605,000	Stk.	Feb. 27	5⅜	**S'th Suburb'n Ord. 5 p.c.**	116—119	..	4 9 7
60,000	,,	,,	5	Do. 5 p.c. Pref.	118—121	..	4 2 8
117,058	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.	120—125	..	4 0 0
502,310	Stk.	Nov. 14	5	**Southampton Ord.**	107—112	..	4 9 3
120,000	Stk.	Feb. 27	6¾	**Tottenham** } A 5 p.c.	120—125	.	5 8 0
398,940	,,	,,	5¼	} and B 3½ p.c.	102—105	+1	5 0 0
149,470	,,	Dec. 13	4	**Edmonton** } 4 p.c. Deb.	59—1C2	..	3 18 5
182,380	10	Dec. 30	8	**Tuscan, Ltd.**	10¼—..	..	7 8 11
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
193,742	Stk.	Feb. 27	5	**Tynemouth** 5 p.c. max.	105—107	..	4 13 6
255,636	Stk.	Feb. 13	6½	**Wandsworth** } B 3½ p.c.	128—133	..	4 17 9
80,075	,,	Dec. 30	3	} and Putney } 3 p.c. Deb. Stk	73—78	..	3 16 11
845,872	,,	Feb. 27	5⅛	**West Ham** 5 p.c. Ord.	99—102	..	5 0 6
185,000	,,	,,	5	Do. 5 p.c. Pref.	118—120	..	4 3 4
228,300	,,	Dec. 30	4	Do. 4 p.c. Deb. Stk.	102—107	..	3 14 9

† Next dividend will be at this rate. Prices marked * are "Ex div."

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *April* 25.

The market has been quiet throughout the week, no doubt partly through the intervention of the holidays, and prices have barely been maintained. Unfavourable weather also has checked home demand. Consequently, the closing quotations are £12 7s. 6d. per ton f.o.b. Hull, £12 10s. per ton f.o.b. Liverpool, and £12 12s. 6d. per ton f.o.b. Leith. For July-December delivery, the position is unchanged; for, while makers maintain a firm attitude, buyers are not showing any interest. For delivery over the summer months, however, there is inquiry, but no buyers unless at a substantial discount on spot prices.

Nitrate of Soda.

The market remains quiet, and the quotations are 10s. 6d. and 10s. 9d. per cwt. for 95 per cent. and refined qualities respectively.

Tar Products. LONDON, *April* 27.

The markets for tar products have been without alteration during the past week. Pitch remains in about the same position. Business has been done on the east coast ports for prompt delivery at 19s. per ton; while on the west coast, business is reported in Manchester at 19s. per ton, and at Liverpool at 20s. In London, it is still possible to buy for near delivery at 20s. to 20s. 6d.; while for forward delivery, manufacturers are reported to have accepted 21s. Benzol 90 per cent. remains unchanged. Business is stated to have been done on the east coast at 7½d. per gallon. Benzols 50-90 per cent. are quiet, and there are sellers in London at 8d. for delivery to the end of the year. Toluol is also quiet, and business has been done in London for prompt delivery at 8½d.; and there are still sellers at this figure. There is no alteration in solvent naphtha. London makers would be disposed to accept 10d. for delivery to the end of the year. Creosote is quiet, and it is possible to buy ordinary makes in London at 2¼d. to 2⅜d. for near delivery. In the North, 2d. to 2¼d. is about the price. Carbolic acid is quiet. Business is reported in London at 1s. 6¾d.; while at other ports on the east coast, 1s. 6d. to 1s. 6¼d. has been accepted. Naphthalene is unchanged; and salts are dull.

The average values during the week were: Tar, 12s. to 16s. *ex* works. Pitch, London, 20s. to 20s. 6d. f.o.b.; east coast, 19s. to 19s. 3d. f.o.b.; west coast, 19s. to 20s. f.a.s. Benzol, 90 per cent., casks included, London 8d. to 8¼d., North 7½d. to 7⅝d.; 50-90 per cent., casks included, London 7⅜d. to 8d., North 7¼d. to 7⅜d. Toluol, casks included, 8½d. to 8⅝d.; North, 7⅜d. to 8d. Crude naphtha, in bulk, London 3⅛d. to 3⅜d., North 3¼d. to 3½d.; solvent naphtha, casks included, London 9¾d. to 10d., North 8¾d. to 9d.; heavy naphtha, casks included, London 10¼d. to 10⅜d., North 9½d. to 9⅝d. Creosote, in bulk, London 2¼d. to 2⅜d.; North, 2d. to 2¼d. Heavy oils, in bulk, 2⅜d. Carbolic acid, 60 per cent., casks included, east coast 1s. 6¼d. to 1s. 6⅜d.; west coast, 1s. 6d. to 1s. 6¼d. Naphthalene, £4 10s. to £8 10s.; salts, 33s. to 35s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

In last week's report, the maximum price of tar was mentioned as 16s. 6d. There was, however, no change from the preceding week; and the price remained at 16s.

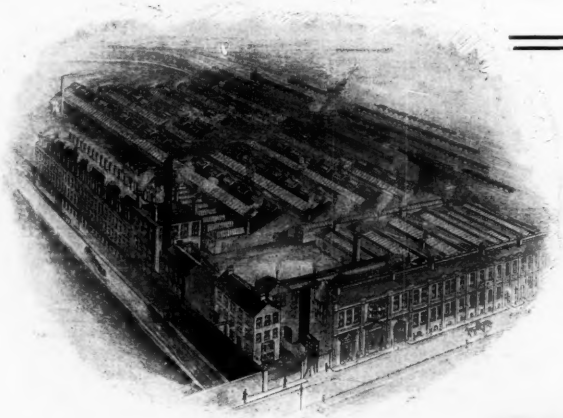
Sulphate of Ammonia.

The market for this article is very firm in price for prompt delivery. The principal London Gas Companies report having sold a small quantity at £12 12s. 6d.; but important lots have changed hands for £12 11s. 3d. on Beckton terms. For forward delivery, they are practically out of the market; but an offer of £12 5s. on Beckton terms would probably receive consideration. In Hull, the manufacturers are asking £12 8s. 9d. to £12 10s., according to quality; while in Liverpool £12 12s. 6d. is reported to have been paid. In Leith, one or two parcels have been sold at £12 15s.; but it is not easy to obtain this price. For forward delivery, the Leith manufacturers are asking £12 7s. 6d. July-December, but up to the present have not obtained this figure.

Price of Gas at Nuneaton.

At a meeting of the Nuneaton and District Tradesmen's Association last Wednesday, Mr. Arnold mentioned the question of the price of gas, and said that it contrasted unfavourably with towns in the North of England, and also with Rugby. Seeing, however, that it was proposed to make an inquiry into the Gas Company's affairs, he thought the question should be shelved until that was settled. Councillor Rayner expressed the opinion that tradesmen should be allowed a preferential tariff light in their business premises; while Mr. Payne said he considered that gas should go down 5 per cent. in price, instead of going up 5 per cent., as it had done. Mr. Arnold pointed out that at Atherstone they were paying 2s. 8d. per 1000 cubic feet, which was cheaper than at Nuneaton. Mr. Payne then proposed, and Mr. Arnold seconded, a motion to the effect that a letter be written to the Gas Company protesting against the price of gas, and pledging the Association, if the advance was insisted upon, to reduce as far as possible the consumption of gas. Councillor Lester, in supporting, said 3s. 6d. per 1000 cubic feet was very much more than ought to be charged in a town of the size of Nuneaton. The motion was carried *nem. con.*

Two men were before the City Police Court in Edinburgh last week charged with having attempted to commit suicide—the one by inhaling gas through a rubber tube, and the other by cutting his throat with a pocket knife. Both pleaded guilty. Evidently, in the mind of a Magistrate of Edinburgh, inhaling gas is a much more serious offence than throat-cutting; for in the case of the former, the sentence was one of imprisonment for ten days, while in the case of the latter it was one of detention in the police cells for three days.



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COAL TRADE REPORTS.

Lancashire Coal Trade.

There is nothing new to be said of the coal trade in Lancashire. The extraordinarily cold and wintry weather we are experiencing keeps up the demand for house fuel; and the same cause affects in a similar manner engine and boiler requirements. Coalowners give no hope of any easement in prices for another month at least.

Northern Coal Trade.

There has been a good demand for fuel generally; and since the holidays, the shipments have been heavy, so that the trade has been active. In the steam coal trade, best Northumbrians are now quoted at about 13s. per ton f.o.b., second-class steams 11s. 9d. to 12s., and steam smalls from 7s. to 7s. 6d. The nearness of the opening of the Baltic trade is giving more briskness to this branch of the coal industry; for to the North much of the export of coal is made. In the gas coal trade, the demand is moderate for home use; but the quantities sent foreign are larger than usual. Thus the production seems to be well taken up. Durham gas-coals vary in price from about 10s. 9d. to 11s. 6d. for the usual classes, and from 12s. to 12s. 3d. for "special Wear" kinds. As to contracts, more have been settled. One, for export to Mogano, has been booked for a year ahead, at about 10s. 9d. per ton f.o.b., for some 50,000 tons. The London Gas Companies have also got a considerable part of their needs met; the bulk of the contracts being settled at prices that range, according to quality, from about 10s. to 10s. 6d. per ton f.o.b. It is quite probable that the remaining contracts for the Metropolis will be fixed at something near these figures. As to coke, the market is steady. Gas coke is a little firmer, and is quoted from 14s. to 15s. per ton f.o.b. in the Tyne or the Wear.

Scotch Coal Trade.

Trade remains unchanged. Shipping continues to do better; and, consequently, the output is fairly well taken up. Ell is in good demand; and the price is maintained. Splint is plentiful. The cold weather is keeping up the request for household descriptions. Small stuffs are also in good demand. Lord Ardwall, as Umpire under the Conciliation Board, heard parties in the course of last week upon the demand of the coalowners for a reduction of 12½ per cent. upon miners' wages, and on Saturday he issued his finding, in which he orders a reduction of 6¼ per cent., equal to 3d. per day, on and after the 27th inst. The prices quoted are: Ell 10s. 3d. to 11s. 6d. per ton f.o.b. Glasgow, splint 10s. 9d. to 11s., and steam 10s. 3d. to 10s. 6d. The shipments for the week amounted to 289,422 tons—an increase of 15,039 tons upon the previous week, and of 39,594 tons upon the corresponding week of last year. For the year to date, the total shipments have been 3,624,436 tons—showing a decrease of 400,477 tons upon the corresponding period of 1907.

New Gas-Works Started at Los Angeles (California).

Rather more than a year ago, a Company was formed, with a capital of $1,000,000, to supply Los Angeles (Cal.) with gas. A site was acquired for the works, and they were commenced on Aug. 20 last. Their construction was pushed on vigorously, with the result that they were completed in about seven months; and gas was, on the 28th ult., turned on by the Mayor, in the presence of a large representative gathering. The works, which cover an area of 6½ acres, consist of a boiler and engine house, 48 ft. by 32 ft., built of reinforced concrete; a generator-house, 98 ft. by 54 ft.; two oil-tanks, each with a capacity of 7500 barrels; two sets of purifiers, 32 feet long and 12 feet high, with a capacity of 5 million cubic feet per day; a rotary station meter, with a like capacity; a distributing storage holder, capable of holding 1 million cubic feet; and a 150,000 cubic feet relief holder. The generator-house has four generators, with a daily capacity of 1¼ million cubic feet. The foundations were planned to accommodate four additional generators, increasing the capacity to 10 million cubic feet; thus providing for future demands. Some 40 miles of trunk mains have been laid; and it is expected to have the first 100 miles completed by the end of June. The works were constructed by Mr. J. M. Berkeley, the Engineer of the Company, with the assistance of Mr. A. Ross, the General Manager, who formerly filled a similar position with the Laclede Gas Company.

Suffocation of a Gas-Fitter.—Mr. H. Franklin, the Deputy-Coroner for the Central Division of Oxfordshire, held an inquiry at Cowley, near Oxford, last Thursday, into the circumstances attending the death of Edward Harris, aged 42, a fitter in the service of the Oxford Gas Company. Harris was making a connection between the main and a house at Cowley, assisted by a man named Joyce. The latter was walking to and fro while Harris worked in an opening in the ground which had been made to reach the main. On looking into the hole, which was only from 12 to 15 inches deep, Joyce observed that Harris had fallen forward over the tapped main; and, though he immediately pulled him out, and, with the assistance of two medical men, attempted to restore life, all efforts were unsuccessful. Only two minutes had elapsed from the time Joyce saw Harris to the time he found him in a state of collapse. Mr. George Smith, the Under-Manager of the Company, stated, in answer to a question by the Foreman of the Jury, that the men were not supplied with respirators when doing the kind of work on which Harris was engaged, as it was not considered dangerous. He had cut hundreds of mains in his life. Mr. F. Buckingham, the Company's foreman, said the deceased had complained of giddiness for some time, but did not do so on the morning of the accident. He had been doing fitting work for fourteen or fifteen years; and, being a careful worker, he had never met with an accident before. Medical evidence showed that death was due to coal gas poisoning, and a verdict of "Accidental death" was returned.

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Worthing Water Supply.—Worthing has quite recovered from its water scare of half-a-dozen years since, and its new and improved supply is now one of its chief attractions as a seaside resort. The past year's working has left the Town Council with a balance of £862, which is greatly in excess of the amount anticipated (£301). There is now reasonable anticipation of a reduction in the water-rate to the extent of 5d.—making the charge only 4d. in the pound.

Cost of Public Lighting at Bradford.—At a special meeting of the Finance Committee of the Bradford Corporation held last Thursday, to consider the estimates to be submitted to the City Council to-day, a question arose with regard to the cost of public lighting. At present the amount paid to the Gas Committee by the Finance Committee for this purpose is £26,000; but it is contended that the actual cost is £31,000. It was decided to recommend that in future the Finance Committee should undertake the full responsibility for the cost of street lighting, which will mean a payment from the rates of £31,000, instead of £26,000, though, of course, it will enhance the profits of the Gas Department by the difference between these two sums.

Cape Town and District Gas Company, Limited.—At the eighteenth ordinary general meeting of this Company next Friday, the Directors will report that the result of the working in the year ending Dec. 31 last is a profit of £11,483. Adding the amount brought forward (£1058) makes a total of £12,541. Out of this, there has been provided the debenture and debenture stock interest, as well as a dividend upon the 4½ per cent. cumulative preference shares for the half year to April 30, 1907; leaving £292 to be carried forward. The Directors regret that the profit is not sufficient to provide the dividend upon the preference shares for the six months ending the 30th of November, owing to the depression existing in Cape Town, which has reduced the profits of every undertaking. The quantity of gas made last year was 159 million cubic feet; being an increase of 7½ millions in comparison with 1906, due largely to a reduction in price and energetic pushing of business, aided by lectures and demonstrations on the advantages of gas. The Company's Manager (Mr. E. P. Reilly) has been testing a local coal suitable for gas making, and has obtained very favourable results.

Buenos Ayres (New) Gas Company, Limited.—At the annual general meeting of this Company next Tuesday, the Directors will submit the accounts for the year ending Dec. 31 last, which show that the profit, after writing off bad debts and making ample provision for doubtful ones, was £60,689. Adding the amount brought forward from the last accounts (£25,044), there is produced a total of £85,733, which the Directors recommend should be appropriated as follows: Debenture interest, £10,000; interim dividend, paid last October, of 6s. per share (free of income-tax), £18,000; interest on new capital to June 30, 1907, £1348; to discount and expenses *re* issue of debenture stock (final payment), £2112; final dividend on £700,000, at the rate of 8s. per share, making 7 per cent. for the year (free of income-tax), £28,000—leaving a balance of £26,272 to be carried forward. Out of the revenue last year, the sum of £30,562 was expended on the upkeep of the works, mains, &c., all of which are reported to be in a high state of efficiency. The Directors report that the business of the South Barracas Gas and Coke Company, Limited, is making steady progress, and will, they think, progress still further when once the proposed water-works are constructed.

Municipal Undertakings at Huddersfield.—In connection with a review of the work of the different Corporation undertakings, Alderman Willans, the Chairman of the Huddersfield Finance Committee, informed the Town Council that for the past year the water-works showed a deficiency of £19,783, including £16,537 in respect of interest previously capitalized. The Committee asked for £16,831, or a rate of 9d. in the pound; the balance of £2952 to be taken from the depreciation and contingencies account. The period allowed for capitalizing interest did not expire until July 22 last; but the Committee ceased capitalizing interest from April 1, 1907, which had the effect of charging to revenue account about £16,500 for the past year. A surplus of £6651 had been made by the gas-works, compared with £14,231 in the previous year. The decrease was mainly due to reduced charges for gas and dearer coal. A sum of £3740, or 2d. in the pound, had been transferred in relief of the borough rate, and £2911 carried to depreciation and contingencies account, which now stood at £35,067. The electricity undertaking income was £30,353, compared with £27,923 in the previous year. The surplus, after providing for interest and sinking fund, was £985.

Suggested Additional Chalk Water for London.—A correspondent has sent the following letter to the Engineering Supplement to "The Times:" "If we may judge from the recent action of the Metropolitan Water Board, the opinion of the Board's advisers on the vexed question of an increased supply for London would appear to be wholly in favour of the provision of gigantic reservoirs for the storage of flood waters in the upper valleys of the Thames and Lea. In these reservoirs, the somewhat turbid water, by means of prolonged standing and largely by the action of natural sedimentation, would become so far clarified that very slight filtration would adapt it for use. I do not hear that efforts are being made to employ to any material extent the water derived from deep wells in the chalk; and, in spite of the great and obvious advantages of the water procured in this way, there seems good reason to believe that the advisability of the search for a supply of deep well water is no longer entertained. Many experts of undoubted authority, from the days of Prestwich onwards, have advocated the use of chalk water, which is water of extreme purity, though considerably harder than river water, especially river water procured at times of heavy rainfall. Various systems are available, however, for softening the chalk water, and it possesses the added advantage of great uniformity of temperature and relative coolness in the summer time. Public opinion on the Continent—chiefly in view of the increasing pollution of all the larger rivers—is decidedly opposed to the use of such water for town supplies, even where careful filtration is resorted to; and, looking to the fact that very large volumes of water are stored up in the chalk and the greensand beneath our feet, it would be interesting to learn the reason for the vast expenditure upon new reservoirs, and the neglect of the relatively pure spring water."

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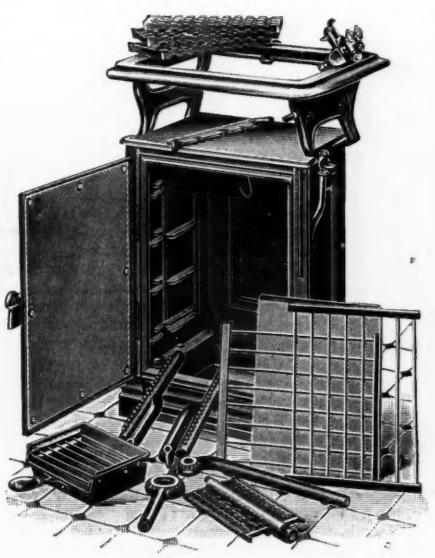

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New Issues of Gas Capital.—It will be seen, from an announcement which appears elsewhere, that an opportunity will be afforded to investors to-morrow, by Mr. Alfred Richards, to obtain holdings in two well-established Gas Companies. He will offer for sale at the Mart, by order of Directors, new issues of £5500 of consolidated stock of the Uxbridge Gas Company, and 200 £10 new ordinary shares and £6000 of 4 per cent. perpetual debenture stock of the Ascot District Gas and Electricity Company. On the same occasion he will submit for competition, for private owners, 77 £10 "B" shares in the Dorking Water Company, £400 of consolidated "B" stock and £425 of 5 per cent. perpetual debenture stock of the Croydon Gas Company, and £750 of general capital stock of the King's Lynn Gas Company.

The New Gasholder for Manchester.—Referring to the letting of the contract for this holder, of which some particulars were given last week (p. 166), a correspondent writes: "As a great deal of interest has been taken in the letting of this large contract to an outside firm, it may be pointed out that, in the first place, it would not be possible to get the material for such a structure rolled in Manchester, and that the work of constructing a gasholder in the manufacturers' works does not, as a matter of fact, employ a very large number of men; the work being confined to two or three distinct skilled trades. A large portion of the wages will be paid in Manchester during the actual erection of the structure, as gasholder erectors move from one place to another, and make their home where the contract is for the time being."

Alderman Gibson and the Miners' Eight-Hours Bill.—At a meeting in connection with the Manchester Chamber of Commerce, at which a resolution was passed protesting against the passing of the Coal Mines (Eight Hours) Bill, a letter was read from Mr. Alderman Gibson, the Chairman of the Gas Committee of the Manchester Corporation, regretting inability to attend. "While one cannot help being in sympathy with those who work under such conditions as coalminers have to do," Alderman Gibson wrote, "the fact remains that any advance in the price of coal would adversely affect large numbers of very poor people—1s. a ton advance would probably mean that 160,000 householders, owners of business premises, and owners of works in Manchester who are customers for gas would have to pay 1d. per 1000 cubic feet more for their gas—and affect in an equal ratio all gas consumers in the country, small shopkeepers suffering most."

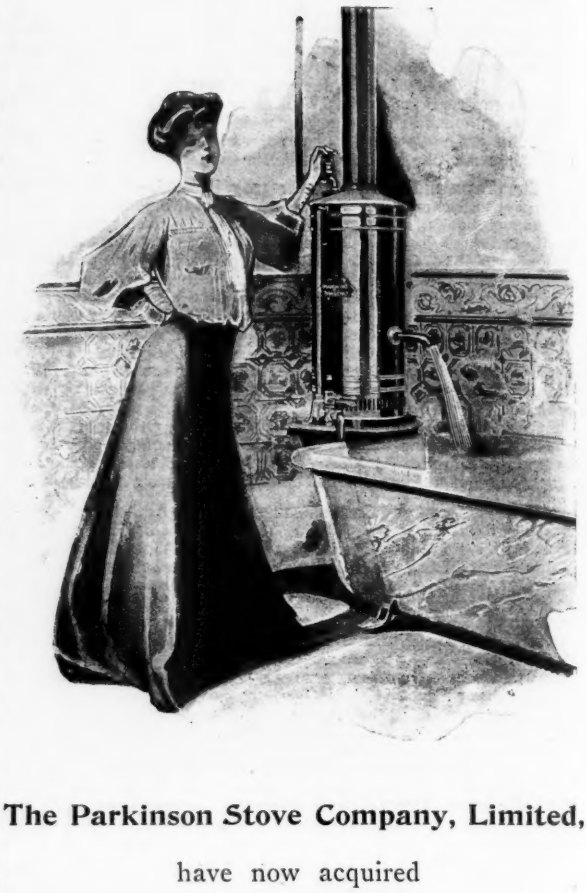
South Molton Water Supply.—The question of the improvement of the water supply was again considered by the South Molton Town Council last Tuesday week. In accordance with the instructions of a previous meeting, the Surveyor presented a report showing that the cost of Candy filters would be £750, and how the work of renewing the water-mains could be divided. His recommendation as to the mains was that the scheme should be divided into 17 sections; and the Town Clerk explained that if this were done the cost would be spread over 17 years from 1909. Mr. Sanders contended that it would be better to borrow the sum required for the whole work, and get it done in one year. The present proposal meant disturbing the streets for 17 or 18 years, and was mere tinkering with the matter. Several members spoke against the scheme; but it was decided, by a majority of 8 votes to 6, to send the plans to the Local Government Board and apply for power to borrow the money for the filters.

Reduced Price of Gas at Burslem.—In the "JOURNAL" for the 7th inst. (p. 50), it was mentioned that the Burslem Town Council had reduced, as from the 1st of January, the price of gas to ordinary consumers to 2s. 6d. per 1000 cubic feet, with a discount of 6d. per 1000 feet on accounts paid within one month after delivery, against 2s. 8d. and 2d. discount; and that slot-meter consumers and users of gas-engines were to have a proportionate reduction. We learn that in the case of the slot-meter consumers the price will be at the rate of 3s. 4d. per 1000 cubic feet, with 10d. per 1000 feet discount on collection, where the pipes and fittings are the property of the tenant or the landlord, and at the same rate, with 4d. discount, where they belong to the Corporation. The following are the new terms, per 1000 cubic feet, for gas-engine users: Consumption up to 50,000 cubic feet, 2s. 6d.; up to 100,000 cubic feet, 2s. 4d.; above this quantity, 2s. 2d.—in all cases less 6d. per 1000 cubic feet on accounts paid within a month.

Primitiva Gas and Electric Lighting Company of Buenos Ayres, Limited.—In the report of the Directors of this Company to be presented to the shareholders at the annual meeting to-day, they state that the amount standing to the credit of profit and loss account for the year 1907 is £105,420. Adding the balance brought forward, a total of £122,032 is produced. Deducting interest, dividends on the preference shares, the interim dividend of 2s. 6d. each paid on the ordinary shares in October, and a sum of £6221 placed to the general reserve, there is left a balance of £33,881, out of which the Directors recommend payment of a final dividend on the ordinary shares of 4s. 6d. per share (free of income-tax); making a total distribution of 7 per cent. for the year. This will absorb £18,000, and leave £15,881 to be carried forward. There was a steady increase in the demand for cooking and heating stoves last year. Considerable extensions have been made in the offices and show-rooms, as well as in the distributing plant; and the works have been kept in efficient repair.

Tees Valley Water Board.—At the last meeting of the Tees Valley Water Board, the Chief Clerk (Mr. D. D. Wilson) read a statement showing that the capital expenditure for the half year ending Feb. 14 last was £28,729, bringing up the total cost of the undertaking to £2,729,871. During the six months, £26,618 had been received on capital account; the total amount received to date being £2,729,020, or £851 less than the sum expended. The revenue account showed the income to have been £63,550; being an increase of £4096 as compared with the preceding half year, and an increase of £5514 as compared with the half year ending Feb. 14, 1907. The expenditure on revenue account last half year amounted to £11,641 16s. 3d.; being an increase of £660 as compared with the preceding half year, and an increase of £863 on the corresponding half in 1907. The balance carried to net revenue account was £51,908, as compared with £48,472 in the previous half year, and £47,257 in the corresponding half of 1907. The net revenue account was debited with several payments for interest, &c., and was credited with the interest allowed by the bank. After being dealt with in this manner, there remained a balance of £83,825, including £35,338 brought from the previous half year.

WATER HEATING.



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